A STUDY OF BUILDING PROCUREMENT PROCESS AS A POTENTIAL TOOL TO ENHANCE SAFETY PRACTICE IN THE CONSTRUCTION INDUSTRY

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Ph. D. Thesis

2008

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Submitted in Partial Fulfilment of the Requirements of the Degree of Doctor of Philosophy, November 2008

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ACKNOWLEDGEMENTS

BISMILLAHIRAHMANIRAHIM.

Firstly, I am indebted to the University of Malaya, Kuala Lumpur for sponsoring my doctoral study at the University of Salford, Manchester. My special gratitude and appreciation to my supervisor, Prof. Peter McDermott who has shown great patience and care in guiding, advising and motivating me in those challenging time in completing this research. I would also like to record my sincere thanks to all members of the School of The Built Environment, Salford University whom have made my time there happy and memorable and especially to Prof. Ghassan Aouad for his sincere moral support.

Secondly, I wish to record my thanks to the many individuals related to the projects in my case study, which has directly assisted me in making the research possible. In the UK, Helsby High School Project- Mark J. Stocks, Mark Pallett, David Passey, Michael Anderton; Langworthy North Refurbishment Project-Peter Dunbevant, Stuart Boott, Dr. Kamarul Salleh, Jim Crellin, Lindsey O'Conell, Shaun J. Smith. In Malaysia, Police Head Quarters Project- Abdul Manan Mat, Zawiyah Hamad, Ahmad Azmi, Abdul Rahman Dagang, Takiudin Mat Adam, Mohd. Nasrul Hadi; and The Mosque Project- Abdul Rahman Yaakub, Meor Azim Meor Abu Bakar, Aldela Nordin and many other individuals in these projects not mentioned but have given their valuable support and contribution in this research. Special thanks to Dr. Stephen J Peckitt of HSE London for his valuable time and advice. I must mention my sincere thanks to my Indonesian colleague Dr. Akhmad Suraji who has given so much encouragement and continuous support for me to complete the task. Thanks also to all members of The Faculty of Built Environment, University Malaya for their valuable support and encouragement.

Finally, my love and thank to my wife Zaliha Rahim who endured with sincere love and patience all hardship taking care of our family during those challenging time while doing this research. To my lovely children Safiya (Along), Siti Hajar (Angah) , Asma (Kak Ma), Sarah (Kak Cik), Asiah (Mariam) and Luqman (Luq) who have given me the strength and inspiration in completing this research, thank you. To other family members, especially to my mother and in-laws, thanks for all the prayers. My tribute too, to all the workers who risked their live working on construction sites all over the world.

Khairuddin Sulaiman
University of Salford
July 2008

ABSTRACT

Building procurement involves many different parties and resources. It is very common that requires project participants involved to work within budget, on time and according to quality prescribed as well as they must work safely. Sadly, safety aspects have been insufficient and lacking in many construction projects around the globe. However, as time progresses, safety is now becoming the fundamental measure of project performance. Hence, this research is an exploratory and explanatory investigation of how to enhance the implementation of construction safety practice throughout procurement process. As we speak, improvement of safety in construction is not only treated as technical aspects, but also as an organisational and managerial aspect as well.

Firstly, the premise of this research is to show that client leadership and commitment as well as project team integration within the whole procurement process will influence safety practice in the construction industry. Secondly, the context of this research is drawn on the underlying theories of building procurement and construction safety. Therefore, thirdly, the primary objective of this research is to study how the procurement process acts as a potential tool to enhance safety practice in the construction industry. A framework developed for this research was based on procurement systems and accident causation theories as well as the process protocol.

The current theories of accident causation suggest that improved safety in construction must start since in the beginning of project procurement process while integrating client and project participants toward synergy to mitigate any factors undermining safety in downstream production level.

A case study strategy in two different countries, the UK and Malaysia, was selected as this provided justification of how procurement and people involved practising safety. The case study objects were undertaken by design and built and traditional procurement method. Different level of safety maturity is the justification of the countries selected. It was also intended to investigate lessons learned from the UK safety practice that can be used to improve the Malaysian construction industry. Multiple sources of information, data and evidence from 2 of the UK cases and 2 of the Malaysian cases were investigated through semi-structured interviews and questionnaire surveys.

In this research, three propositions were explored. The first is that improved procurement process, the client leadership for better safety policy in the procurement process and team integration throughout project procurement process can enhance health and safety practice. The findings are presented as data comparisons and analytical generalisations, from both intra case and cross case analyses as well as questionnaires. The main results show that procurement process with better client leadership and commitment as well as stronger project team integration can enhance safety practice in the construction industry.

This research suggests that improving safety in construction is not only in the hand of construction companies but also any other project participants right from beginning of project procurement throughout project implementation. It is also suggested that Malaysia may take more attempts to persuade clients and client's project team to deal with safety issues seriously long before construction project commencing on site.

CHAPTER 1: INTRODUCTION

1.1 Introduction and problem statement

In many countries, the construction industry is a unique sector of the economy. Hillebrandt (1984) describes the industry as a single industry within a sector of the economy. Since the inconsistencies of the business process of the industry, Hindle (1997) suggests that the construction industry should be viewed as a series of industries, markets, business entities and projects, inter-linkages by a dynamic web of common issues, resources and constraints. It involves a broad range of stakeholders and fragmented shareholders. It has wide and complex linkages with other areas of industrial business and economic sectors, such as manufacturing, building materials, labour, equipment, finance, and technology. In other words, the construction industry encompasses a broad range of conglomeration of industries, business, and economic sectors to create and maintain fixed assets of infrastructure within the built environment. Turin (1973) reveals that the industry is an engine of economic growth and being central of economic and social development in any country.

As with the important role of the construction industry, it is unfortunate that this industry has serious bad image. In general, the construction industry is publicly perceived as dirty, untidy, tedious, dangerous and difficult working condition. This negative image is magnified by building failures, quality problems, unintentional injuries and construction fatalities, schedule delay and cost overruns, low productivity, low professionalism among project participants, lack of research, and inconvenience to the public during construction of public projects such as highways, and sewerages (Bodapati & Naney, 2002).

Chapter 1: Introduction

Different from other problems, safety issues in the construction industry has become a major issue of concern of any stakeholder as a consequence of safety failures. This industry has been recognised, for many years, as among the industries that has a high likelihood of accidents (e.g. Hinze and Applegate, 1991; Adrian et al, 1994; Alves Diaz, 1996; Khalid, 1996; Rowlinson, 1997; Duff; 1998). The United Kingdom's Health & Safety Commission (HSC) recorded that the incidence of fatal accidents in construction in the 1996/1997 data was eight times the average for all industries. Snashall (1990) found that, on average, five construction workers were killed every two weeks and one member of the public was killed every month by construction activities in the UK. Meanwhile, across the European Union (EU), 67% of workers in the construction sector believed that they are at risk of having accidents (Commission of European Communities, 1992). This trend is similar in highly developed countries like the United States of America, which their figures show six to ten fatalities occurred on construction sites every working day throughout the United States (Lucker, 1996).

It is no doubt that construction accidents have affected many aspects of the construction project. Such evidence came from the UK's Health & Safety Executive (1985), which reported that there were over 370 million lost working days resulting from disruption of the production system and over 15 million days were lost resulting directly from industrial injuries.

With this tremendous impact, one of the implications of construction accidents is a large significant financial loss. Past research that looks into the costs of a construction accident (Hinze, 1996) shows that indirect costs can be higher than direct costs. Sawacha et al, (1995) discovered that for every Pound of an accident cost that the insurance company had to pay out; the total cost to the contractor was from £ 5 to £50. Total losses resulting from various kinds of accidents were found to be at the cost 8% of turnover (HSE, 1993).

It has always been argued that various activities in the construction project are always subject to constantly changing working environment and dynamic working patterns. This may make it almost impossible to control the risk of construction accidents in a manner comparable with other kinds of industrial production, such as the manufacturing industry (Duff, 1998).

It is said that the culture of the industry is very tough and hard. Duff (1998) specifically described that the culture of the industry as a very male, 'macho' and authoritarian one. The industry abounds with conflict of interest due to different views and objectives among practitioners to the construction project (Walker, 1989).

It is common in the construction industry that design and construction are undertaken separately by different professional organisations. Design of the constructed facility is normally the responsibility of an architect and engineer, whereas design of the construction process, including safety, is conventionally considered to be under contractor's responsibility. It is now generally understood in Europe, enshrined in European legislation and, more specifically, since the introduction of the Construction [Design and Management] (CDM)

Regulations 1994 into UK legislation, that design of the constructed facility should take into account foreseeable risks during the construction process (Duff & Suraji, 2000).

Safety issues in developing countries, such as Malaysia, are more crucial and complex. It seems that problems related to construction are concerned with the downstream or frontline players, e.g. contractors and operatives. In Malaysia, like any other developing countries, legislations are still focussed on the contractors or builders. The Malaysian Occupational Safety and Health Act (OSHA)1994 is an enabling act with the aim of promoting safety and health awareness, and establishes effective safety organisation and performance by introducing self-regulation schemes that are specifically designed to suit a particular industry or organisation. Under provisions of the OSHA 1994, contractors are "entrusted" to comply with the provisions of the act. However, safety problems are still a major issue of concern. The evidence shows that, as described in the Figure 1.1, construction accidents still remain high. Lee (2001) quoted that there is a great concern that the number of fatalities has increased from 81 in 1997 to 107 in 1998. This shows that the fatality rate per accident for the construction industry has risen from 2.3% in 1997 to 10.6% in 1998.

In 1997, the Department of Occupational Safety and Health of Malaysia (DOSH) inspected 788 sites in Selangor and Kuala Lumpur and it was found that only 4% of the sites were in the good category, 52% in the satisfactory category and 44% in unsatisfactory conditions. There can be several reasons to this bias attitude of the contractors and employers. One important factor may be attributed due to the use foreign labourers and a large number of them are illegal immigrants. Statistics showed that in 1998, almost 63.4% of construction accidents involved foreign workers as opposed to 29.3% but involved local workers. Figure 1.1 shows

the 7- year time series of the number of accidents occurred since 1992 until 1998. It shows that the number of accidents decreased gradually from 1993 to 1997 as with effective enforcement of Malaysia OSH Act 1994, but the number remains the same in 1997 to 1998.

Figure 1.2 shows another statistic of accidents occurrence in the Malaysian construction Industry reported to the Department of Occupational Safety and Health. Figure 1.3 describes the number of accidents reported to the Social Security Organisation (SOCSO).

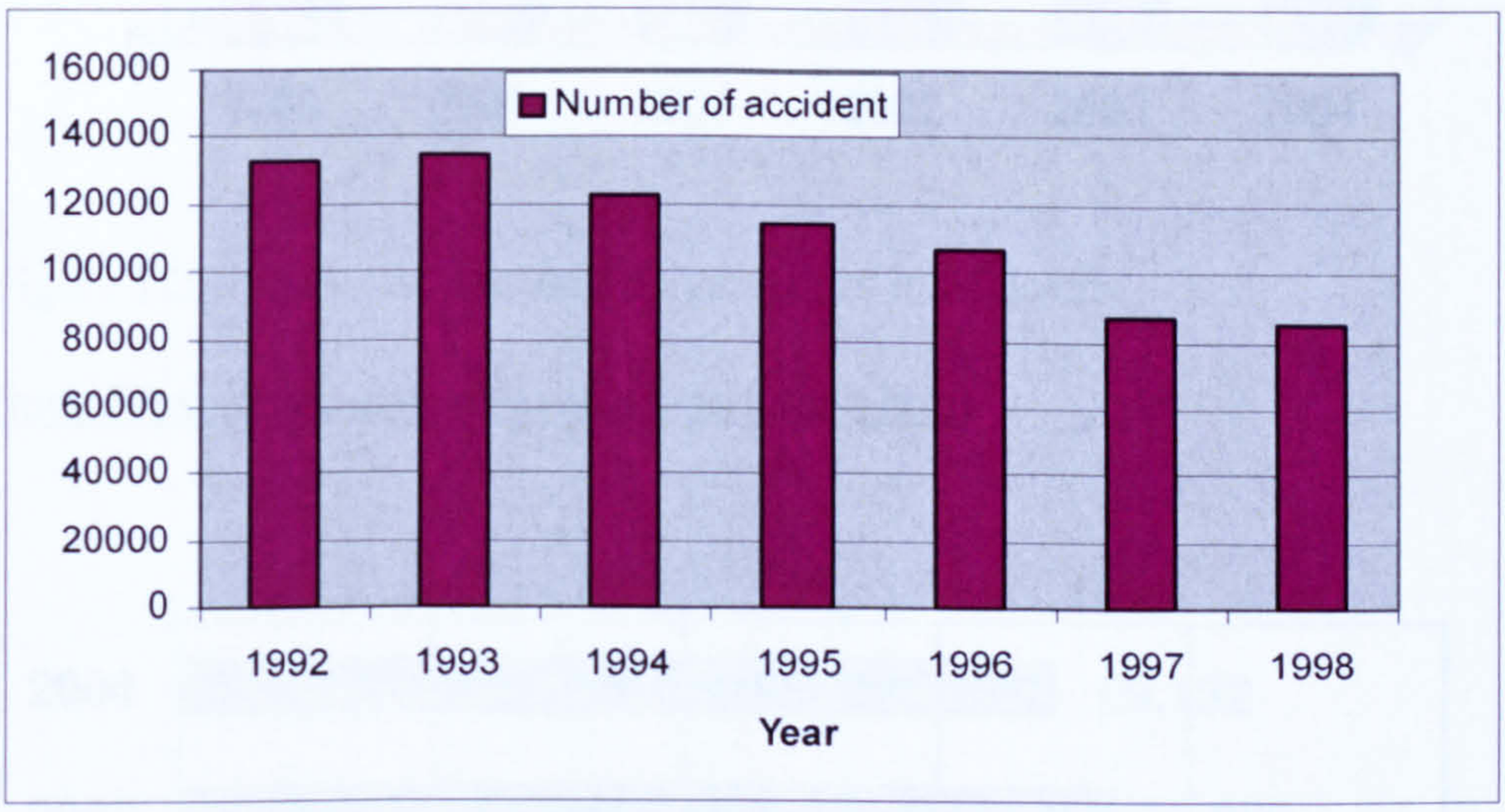

Figure 1.1 Occurrences of Accidents in Malaysia

(Source: Series of SOCSO Annual Report)

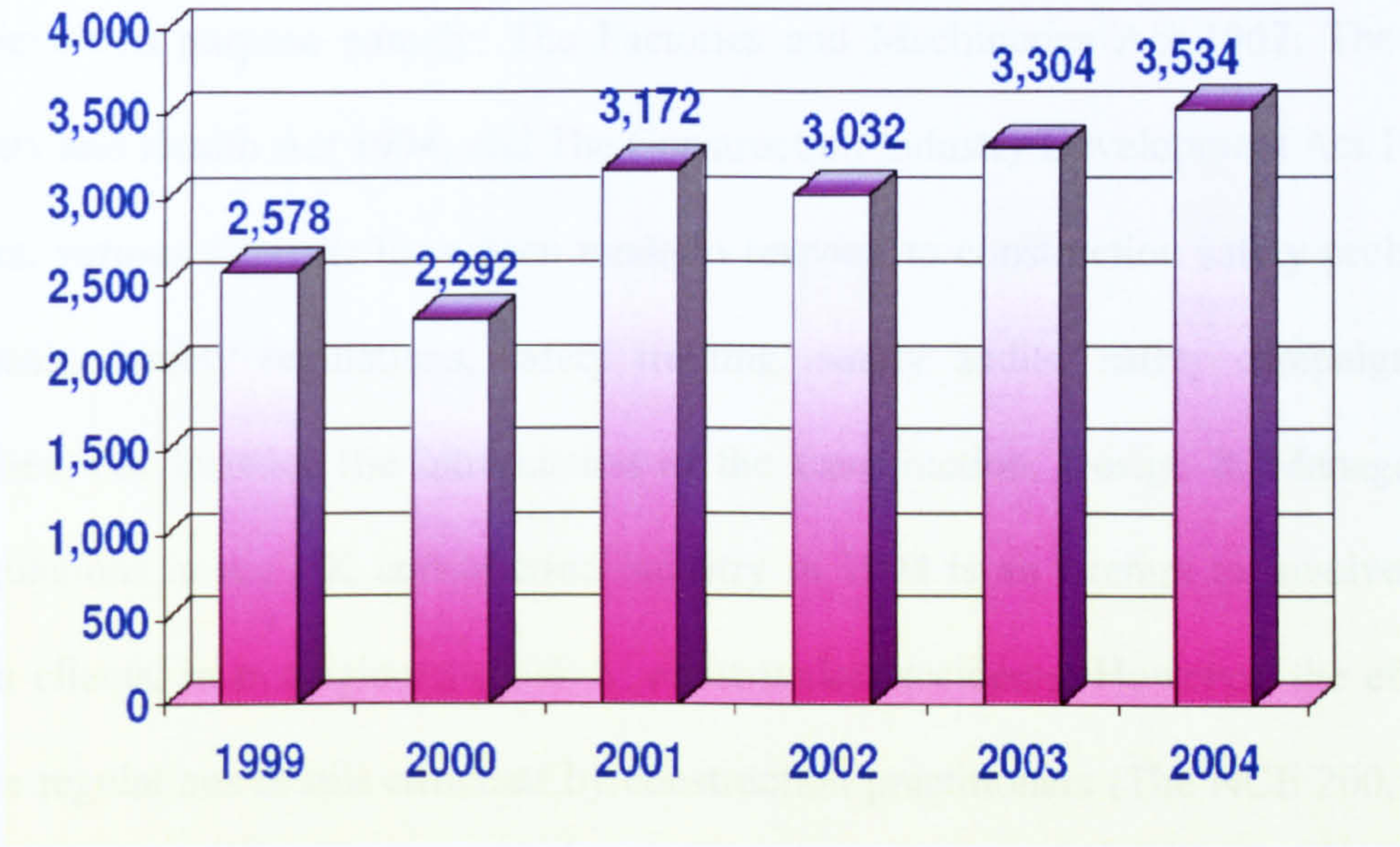

Figure 1.2 Number of Accident Occurrences in Malaysia

(http://dosh.mohr.gov.my/e-web/e-welcome.htm)

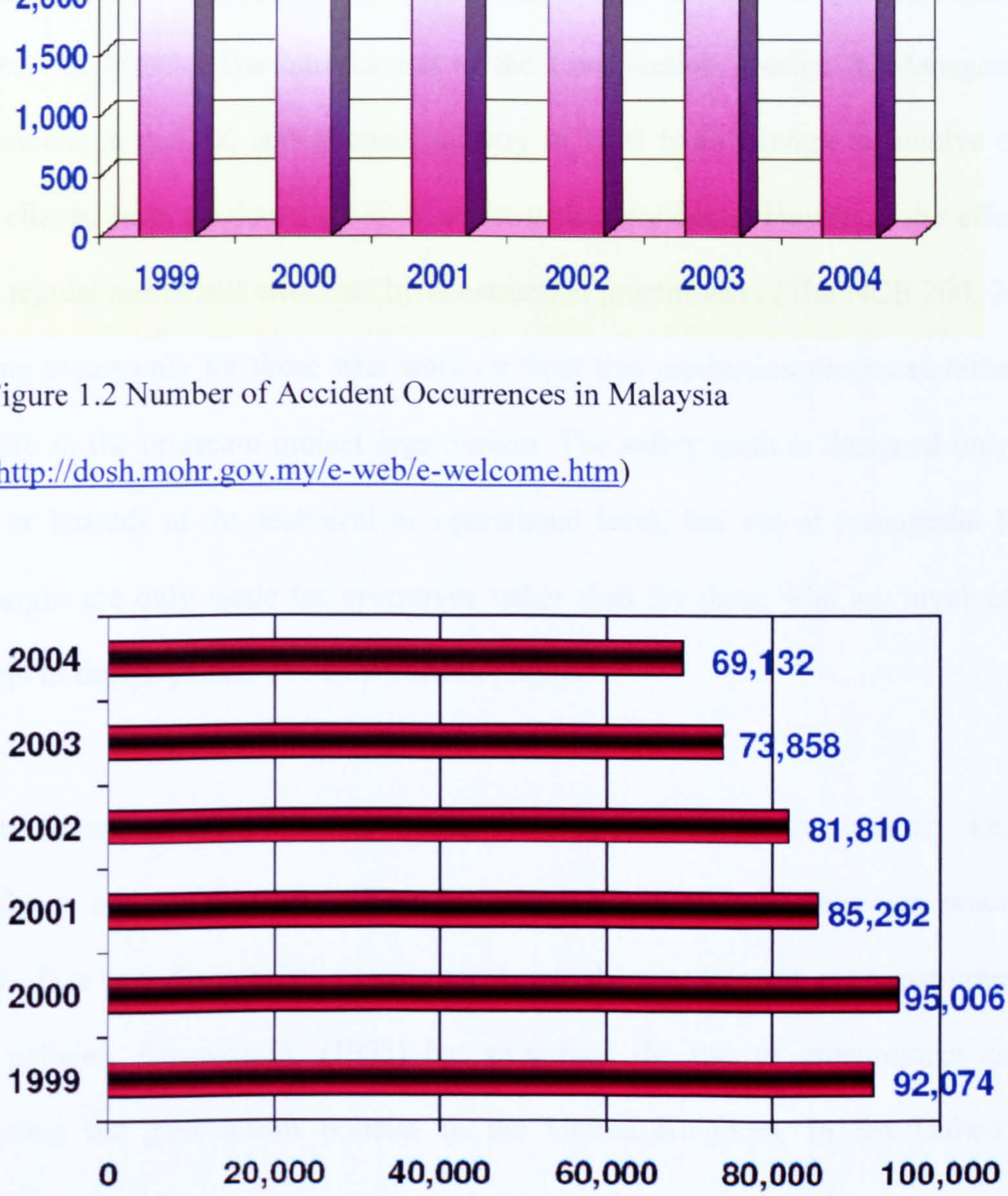

Figure 1.3 Numbers of Accidents Reported to SOCSO

(http://dosh.mohr.gov.my/e-web/e-welcome.htm)

With the determination to tackle safety problems, Malaysia has introduced three basic laws to achieve that purpose namely: The Factories and Machineries Act 1967; The Occupational Safety and Health Act 1994; and The Construction Industry Development Act 1994.For many years, various attempts have been made to respond to construction safety problems, such as imposing safety regulations, safety training, safety audits, safety campaigns and safety studies. For instance the introduction of the Construction, Design & Management (CDM) Regulations in the UK construction industry in 1994 is an attempt to involve designers, or even clients, in managing the risk of construction accidents. However, the effectiveness of these regulations is still criticised by construction practitioners (The NCE 200, 2000). Safety training seems only for those who work on front line production processes rather than those who are in the upstream project organisation. The safety audit is designed only to find out risks or hazards at the technical or operational level, but not at managerial level. Safety campaigns are only made for operatives rather than for those who are involved during the concept or design phases of a construction project.

Despite many efforts on safety issues, the key players in the industry i.e. the client, consultants and builders are still unclear about the relationship between procurement and safety. It is very common that governments use the procurement as an instrument to deliver their policies. Arrowsmith, (1995) has examined the use of procurement as a tool for promoting the government policies in the United Kingdom. In the United States, the utilisation of public procurement for socio-economic purposes relating to equal opportunities has been introduced for quite some time (McCrudden, 1995). The Australian Procurement and Construction Council (APCC, 2000) has developed a strategy called "National Action on Small and Medium Enterprises in Government Procurement". This procurement strategy is

aimed at assisting the growth of this sector by improving SME access to government businesses. The emerging procurement framework offers better opportunities for the development of new partnerships between small firms as second and third tier service providers and product suppliers to government. In developing countries, public procurement has also been utilized by governments to promote national policies for restructuring of the economic and social development of the country. Gounden (2000) highlighted the efforts of the South African government in utilizing public procurement as a mechanism to promote a comprehensive socio economic policy aiming at eradicating the legacy of apartheid and restructuring the economic to benefit the black, women and rural communities. In Botswana, the government has introduces policies and used the public procurement to provide an enabling environment to local citizens (Ofori, 2000) . In Malaysia, the government is utilizing the public sector procurement vigorously to promote the development of its indigenous 'Bumiputra' community, so that the economic 'gap' between the 'Bumiputra' and the others who are already economically advance communities is closed. It is important to understand the background of this policy before looking into the steps taken in term of procurement strategies by the government to achieve these objectives. As with the potential use of procurement to deliver the government's policies, it would be appropriate to introduce procurement as a potential tool to promote and enhance safety practices in the construction industry.

Malaysia is one of the emerging industrialised countries in the South East Asian. The Vision 2020 of this country is to be a developed country by the year 2020 and it makes the construction industry more important as an engine in the development of infrastructure and other related public works as well as properties. However, the industry has suffered bad

publicity due to various common issues, such as quality, productivity and safety. As with other issues, construction safety issues are viewed as a matter of project construction on site rather than a part of the whole project life cycle. Various attempts for enhancing site safety have been made but the burden has been placed on contractors and site operatives. Suraji & Duff (2001) suggested that construction safety is not only concerned with operational and technical aspects of production line or project participants at downstream of project organisation but more systemic aspects involving any stages of the project procurement process. Therefore, clients, designers and contractors as well as operatives must be seriously involved in enhancing safety practices. Safety practice is a holistic way of thinking and behaviour about managing risks undermining safety which allow the identification of underlying causal factors in complex socio engineering systems (Peckitt, 2000).

Governments as stakeholders and the big client of construction projects have a major role in introducing any policies to change safety practices. For many countries, governments take initiatives to provide safety regulations and other policies related to construction safety. Project procurement has been utilised to change social and political schemes. However, no attempts have been introduced to make the project procurement as a key subject to deliver safety policies into practice. The government as the biggest client in the industry can always use its power to ensure that all project participants carry out safety policies as required. In the

case of Malaysia, it would be interesting to find out why the implementation record is so poor despite the commitment shown by the government. An overall study is needed to find out the existing constraints and problems in implementing the existing policies and to identify the areas along the construction process that safety measures can be implemented. All parties

need to be examined closely. Those parties are the contractors, the clients, the designers and consultants, the educational institutions, the professional bodies and all others involved either directly or indirectly. With the identification of existing constraints, then it will be possible to recommend steps in order to improve the situation.

Benchmarking with the UK construction industry, the UK government has gone further in the effort to make the industry a safer place to work by the introduction of the CDM Regulations. This regulation makes a compulsory duty for all parties from the beginning of a project to consider safety. Through this legislation, the client, designers and contractors should share the responsibility to improve health and safety. The UK government itself has also recognised its potential to be the important driver to change the culture of all involved in the industry. The role of government as an influential client in the industry is understandable because of the size of public projects both in developed and developing countries. Governments as clients, procurers, policy-makers can make significant contribution for improving safety by cultural change among the key players i.e. the client, designers and contractors with regard to safety.

In the Malaysian context, the existing legislations are still focusing on the implementation of health and safety by the contractors. It is still concentrating on the downstream activities rather than the upstream activities. Even the latest steps taken by the Malaysian Construction Industry Development Board (CIDB) are targeting the contractors. The role of clients and designers is still vague in respect to health and safety. The existing laws, legislations do not include clients and designers to be responsible from any incident or accident on sites. The government too, still does not recognise its potential as a driver to change safety culture

within the project procurement process. From the initial literature review, it is proposed that through procurement process, steps can be taken to enhance health and safety. The procurement process itself can be an avenue to inculcate safety culture among all players. The client can play an important leadership role to get all parties together, to improve team integration that in turn will improve the quality of the project.

1.2 Aims and Objectives of Research

The primary aim of this research is to investigate activities concerning safety in project procurement process in the UK and Malaysian construction industry. The focus is on the effectiveness of procurement strategies, client leadership and team integration in implementing safety practises. As the research progresses the following objectives have been identified:

- To identify the areas of possible implementation or improvement in safety activities inside procurement process in the Malaysian construction industry based on lessons learnt from UK;
- To investigate and identify the role of clients in better fostering of project team integration to improve safety and;
- To introduce a safety framework incorporated into procurement process as a recommended action taken for improving health and safety practice in the Malaysian construction procurement process.

1.3 Research Initial propositions

Since this is an investigatory research, it creates a pre-conceived assumptions or ideas and views of the area of research or propositions. Yin (1994) identified the importance of

establishing propositions prior to any research dealing with case studies. Based on researcher's working experience as quantity surveying consultant in Malaysia dealing with both public and private projects and through literature review, initial propositions were established as follows:

The Malaysian government as the biggest client in the construction industry has a major role to play in enhancing safety culture to all key-players in the industry.

The procurement process can be fully utilised to enhance site safety. In all stages of the procurement process, there are opportunities to implement measures by relevant key-players to enhance site safety.

Teamwork at all stages of the procurement process plays a crucial part in enhancing site safety

1.4 Research Questions

The research deals with identifying areas in the Malaysian construction procurement process where safety activities can be implemented or improved based on the UK experience. Some questions are identified to guide the research process which will lead to the achievement the objectives as follows:

- What is the level of the implementation of safety activities within the Malaysian construction procurement process?
- Why does the procurement process have direct impact on safety implementation in a construction project?
- What is the potential role of clients in improving team integration which can have a direct impact on construction safety?
- What are the roles of the project participants in implementing safety?

The research covers the study of procurement activities related to safety in the procurement process right from the inception to construction stages. In other words it covers all the up-stream activities to down-stream activities in the procurement process. The scope of the research was confined to the following:

- Investigation of safety practises mainly in the Malaysian construction industry by using the UK experience as a guide to look into the procurement process relating to safety practises; and
- Comparing Malaysian case studies in order to identify the 'gaps' or areas where safety practises can be implemented or improved. The UK case studies will reflect 'real-life' experience of the construction procurement process
- relating safety practises as required by the present CDM(UK) regulations to expose its pros and cons and act as a 'model' for implementation in the Malaysian context.

This research deals with the introduction of the effectiveness and potential value of procurement policy to enhance safety practices in the Malaysian construction industry. It is concerned with the identification of client leadership, project team integration within procurement process as means of delivering project procurement as strategic and potential tools to enhance construction safety.

1.5 The Thesis Structure

This research process consists of four key stages. Each key stage contains one or two major research activities. It began with literature searches concerning procurement and safety, then investigation of safety problems and procurement related policies in the Malaysian

construction industry and lessons learnt from the UK. It is then followed by case studies both in the UK and Malaysia for further benchmarking of procurement effectiveness to enhance safety practices as well procurement strategies between the two countries. Finally, a safety framework or safety checklist is designed to be used in the Malaysian procurement process.

The research was designed into four stages: literature review, problem statement, methodology and results. Each stage is described as follows:

a) Literature Review

This stage dealt with the introduction to the construction industry, procurement and the issues of health and safety. In this stage, overview of the overall scenario of the Malaysian construction industry and the issues facing the industry were discussed. It highlighted the initiatives of the government to improve health and safety in general and compare with the initiatives done by the UK government. This literature review helped laying down the overall thesis structure and explained all the content of the thesis. The discussions concerning safety and procurement in the construction industry, its uniqueness and issues concerning quality, productivity and safety were explored. The background or foundation of the research was established where issues relating to the factors that have impact on health and safety were gained.

b) Problem statements

This stage looked into the overview of the construction industry in both countries, UK and Malaysia. Approaches by both countries in tackling the health and safety issues were investigated and compared. The safety activities and the role of key players will be highlighted and compared.

c) Methodology

This stage dealt with the method selected for the research. The research framework and approach were established. The choice of process model to assist in the mapping of the procurement activities in the production process was determined and then followed by case studies methodology, case study criteria and propositions.

d) Findings & Recommendation

In this stage, the research findings were discussed and conclusions were drawn. Recommendations for further research were recommended.

Thesis Outline

This thesis consists of eight chapters. The first two chapters describe backgrounds to the research and the research context. The following two chapters deal with identified problems related to the research. The last four chapters discuss the methodology and findings of the research as well as conclusions and recommendations. The description of each chapter is summarised as follows:

Chapter 1 -presents background to the research and summarises the main features of the research programme. In this chapter, problems underlying the research are presented. It also describes the research aim and objectives, scope of the research and structure of the research.

Chapter 2 - describes research contexts related to procurement policies and process. It explains the theories underlying the research. It concerns with the procurement process in general. It reviews procurement issues in the construction sector. It discusses existing

conditions procurement process. It also contains the existing procurement system and the issues of project organisation culture particularly upstream activities including design project initiation process and project management processes.

Chapter 3- presents research contexts related to construction health and safety. This is to justify how health and safety in construction needs to be taken into account. It also seeks to understand safety in construction. It summarises features and understanding of the construction safety issues. It presents theoretical causation of accident, the need and justification for safety, cost of accident as well as the need of improvement. This chapter discusses some approaches in improving construction safety, and project participants' role to improve safety. This chapter also contains discussion of factors affecting construction safety. In this chapter, the factors related to safety and procurement is reviewed to map strategic improvement for safety practices in the Malaysian construction industry.

Chapter 4- presents the research framework. It provides the framework of how the research is based upon and it also discusses a model to be tested.

Chapter 5- presents the research strategy and methodology. It discusses the case study approach, research paradigm, research questions, and method of research, criteria, propositions, and tools of interview, document search and development of questionnaires.

Chapter 6-describes findings of the research. In this chapter, case study report is presented. It also discusses case summaries, findings of the research and outcomes.

Chapter 7 -presents findings of the cross case analyses. It compares safety practices, client leaderships, project team commitment and other issues found in the UK and Malaysia case study objects and generalisations.

Chapter 8 -describes conclusions and recommendation. This conclusion is based on the identified problems related to safety practice using cased studies both in UK and Malaysia. Recommendation is made by an introduction of a safety framework for the Malaysian procurement process to enhancement safety in construction industry.

CHAPTER 2: RESEARCH CONTEXT: BUILDING PROCUREMENT

2.1 Introduction

This chapter addresses procurement issues in the Malaysian construction industry by reviewing the current state of the industry related to procurement process effectiveness and its nature. This chapter also addresses the nature of procurement as a tool for enhancing safety practice. The definitions of basic terms and concepts used in construction procurement are elaborated, and some procurement related issues in the context of construction project are also addressed. This is followed by discussions of the different approaches to procurement selection available to the client. In this chapter, current procurement issues and problems related to procurement in the country are also addressed. As the new emerging developing country, the nature of the industry and its development strategy is discussed. Any attempts that have been made by the government to promote procurement effectiveness are also reviewed. This chapter may help to address the research context in terms of how procurement process in which client leadership and project team integration can enhance site safety. This will build the theory underlying the research and the basis of propositions or a model to be tested. In this case, a model to be tested is concerned with how procurement process in which client leadership and project teams are integrated can enhance safety practice.

2.2 The Building Procurement and The Malaysian Development

In Malaysia, the construction industry plays an instrumental role in the country's development. It acts as a catalyst to spur the growth of other sectors in the nation's economy and as such, the industry has often been referred to as the 'engine of growth'. The construction industry provides the economic and social infrastructure for the country's development needs.

The establishment of the Construction Industry Development Board (CIDB) in 1994 is another important step taken by the government to spur and monitor the overall improvement and development of the industry. It is hoped that the Construction Industry Development Board (CIDB) will be the facilitator and enabler of the development of the Malaysian construction industry.

Malaysia is targeting to be an industrialised country by the year 2020 and to achieve this objective the government laid down an ambitious plan called Vision 2020. The key objective of Vision 2020 which was launched in 1991 by former Prime Minister Mahathir Mohammad is to transform Malaysia from a developing country into a fully developed and industrialised country by year 2020. The fundamental economic challenge of Vision 2020 is to achieve a target growth in real GDP of seven (7) per cent per annum over thirty years, i.e., from 1991 to 2020. This target growth requirement has huge impact on the construction industry of Malaysia. Anwar Ibrahim (The Star, 3 September 1996) described that under the Seventh Malaysian Plan, 1996-2000 some RM200 billion worth of construction projects have been identified in order to promote economic growth and to accelerate the process of

industrialisation towards Vision 2020. The impact of Vision 2020 on the construction industry could be assessed in the following key areas.

- Economic growth through industrialisation,
- Population growth,
- Urbanisation and economic growth,
- Infrastructure development, and
- The challenge of sustainable development.

The construction industry as a catalyst for the economic growth for the Malaysian economy has been recognised by the government. This has been shown by various policies taken to ensure that the industry is striving. During the recent economic turmoil due to the devaluation of the national currency, the government has taken serious steps to ensure that the construction industry survives the blow. In spite of the encouraging growth since 1988, the industry is plagued with various issues (Yaacob, 1995) including:

- Shortage of labour,
- Deteriorating quality of works,
- Increase in the number of accidents on construction sites,
- Material shortages, and
- The fragmentation and segmentation of the construction industry.

The government realised that a healthy construction sector is vital in order to spur growth in the economy, a pre-requisite for achieving the objectives of Vision 2020. An important measure taken by the government is the establishment of the Construction Industry

Development Board (CIDB) whereby its main objective is to develop the construction industry to be a major contributing sector to the national economy and capable of producing and delivering high quality construction works, with value for money and responsive to the nation's needs (Rashid, 1998).

Malaysian construction sector faces serious problem pertaining to productivity and shortage of skilled workers (CIDB, Master Plan, 2002). In order to achieve a comprehensive analysis of the challenges faced by the construction industry brainstorming exercises were conducted by CIDB and the following challenges or issues were identified as being critical. CIDB also made some recommendations on how to solve those identified challenges as presented in Table 2.1

Table 2.1 Identification of Problems, Causes and Proposed Solutions of the Existing Malaysian Construction Industry

PROBLEMS	CAUSES	PROPOSED SOLUTIONS
Low Quality	• Low commitment • Low awareness of the importance of quality • Lack of supervision • No mechanism for quality assessment • Insufficient standards & compliance of standards • Lack of skills • Poor construction material used • Low tender price • Cheating • Poor design • Lack of coordination & management	• Improvement of skills and workmanship • Improvement & ensuring the usage of approved construction material • Improvement in design • Improvement in management • New construction techniques that is less labour-dependant • Ensure flexibility to meet customers' needs

	• Insufficient construction time • Speculation driven	
Low Productivity	• Low technology used • Poor project & site management • Usage of unskilled labours • High input cost • Lack of innovation • Poor cost & construction duration estimation • Shortage of construction manpower • High construction wastage • Poor maintenance • Unconducive work environment • Bureaucratic obstacles • Accident□ prone environment	• Provide the infrastructure and support systems to create opportunities for training and research in the construction industry • Develop and promote technology information system and enhance technology progression . • Promote use new construction techniques that is less labour-dependant • Enhancing quality of human capital • Enhance productivity and quality systems of contractors
Fragmentation	• Too many approving authorities • Procurement system • Variegation of inputs • Too many professional bodies	• Create a platform for the interaction of all parties • Review the procurement system • Encourage cooperative competition
Poor Image	• **High incidents of accidents** • Absence of job security • Poor management • Insufficient promotion • Low wages for high risk jobs • Lack of opportunity for career advancement	• Images will be influenced by actions taken on all other issues

Lack of Ethics	• Absence of code of ethics for contractors • Greed • Survival needs • Cronyism • Ineffective procurement system • Ease of market entry-construction the last choice	• • Enforce strict registration rules • Promote code of ethics • Make construction a career • Imbue professionalism
Shortage of Skill Manpower	• Poor industry image • No accreditation of skills • Insufficient and under utilise training facilities • Migration of workers to foreign countries • Lack of training cultures • Too dependent on labour • Regional labour immobility • Too many construction activities at one time	• Encourage innovative approach in minimising labour dependency • Labour utilisation limited to high value added tasks
Lack of Data & Information	• No centralise system to compile the scattered data • Reluctance to divulge data • Methodology of data collection is outmoded	• Identify the relevant information • Collect baseline information

Source: CIDB (1998)

2.3 Procurement: Definition and System

The term "procurement" has been widely used in many contexts and different fields, such as commerce, industry, agriculture, defence and construction. In this research, understanding definition, principle and fundamental thought of procurement is of importance to understand the nature of procurement in construction. This may assist to identify which parts of the construction procurement can be used to enhance health and safety practice.

In the linguistic context, the term "procurement" is a noun which comes from verb "procure" which means obtain, acquire, secure, get hold of, get, buy and gain. The Oxford English Dictionary defines this term as "the act of obtaining by care or effort, acquiring or bringing about". Hibberd (1996) argued that the concept of procurement can raise awareness of issues involved both in challenging generally accepted practices and establishing strategies. Further definition of procurement by many researchers varies according to some aspects to include, such as process, objectives, parties involved, management used and practice.

In relation to procuring construction project, for instance, Ireland (1985) defines procurement as "an overall management structure and specific management practices in use on a project". This definition emphasises on management system used to procure a project. Mohsini and Davidson (1989) define procurement as the acquisition of new buildings, or space within buildings, either by directly buying, renting or leasing from the open market, or by designing and building the facility to meet a specific need.

Chapter 2: Research Context: Building Procurement

The International Council for Building and Construction (CIB) Working Group 92 provides working definition of construction procurement as the framework within which construction is brought about, acquired or obtained (McDermott, 1999). Leonard and Mohsini (1998) describe procurement as a strategy to satisfy client's development and/or operational needs with respect to the provision of constructed facilities for a discrete life cycle. This reflects that procurement strategy must cover effective and efficient activities of a whole process required to procure constructed facilities in which the client satisfaction and objectives are met in accordance with the client needs throughout the whole life of those constructed facilities.

Procurement is therefore an important tool to achieve the client's objective. Masterman (2002) concludes that there is a need to accept that contemporary procurement systems includes not only the design and construction of projects but also their financing, operation, facilities management and proposed the following definition: " A procurement system is the organisational structure adopted by the client for the implementation, and at times eventual operation, of a project." McDermott (1999) maintains that procurement should encompass not only the method used to design and construct the project but also the cultural, managerial, economic, environmental and political issues raised by the implementation of the procurement process.

No single common definition of procurement is accepted in construction subject. However many definitions have included the context and circumstances of process, people, management system, relationship within which any particular project is intended to procure. The inclusion of specific terms describing the host environment helps to clarify the term

'procurement' within that environment, but it may restrict other perspectives and understandings by other research in other environments. In the context of the construction industry, it is contended that viewing procurement as a process brings into perspective all the factors and issues influencing the successful acquisition of construction projects

In principle, the term "procurement" can also be defined as a systematic process of conception, planning and design as well as construction involving individual, organisational and management systems in order to acquire a constructed facility. The procurement covers the overall process of getting those works done. This research scrutinised all the process of procuring the project to reflect the focus on enhancing health and safety. Whatever the procurement definitions maybe, the most important factor that affects the choice of procurement to be used is the client. The client is the initiator of any project. Project implementation begins with the client, the sponsor of the construction process, who provides the most important perspective on project performance and whose needs must be met by the project team (Latham, 1994). Masterman (2002) proposes the following definition of a client: "The organisation, or individual, who commissions the activities necessary to implement and complete a project in order to satisfy its/his needs and then enters into a contract with the commissioned parties".

As with the definition of procurement above, many phrases come from the use of procurement in practice and research. Some phrases, such as procurement method, procurement system, and procurement strategy, procurement policy are used to identify principles of the procurement and its development in construction field. The term procurement system, contractual arrangement, contract forms and price determination mechanisms are usually used

synonymously (Love, Skitmore and Earl, 1998; Fellows, 1993; Hibberd and Basden, 1996). This proliferation of definitions for procurement system widely accepted in the construction industry, (Love, Skitmore and Earl 1998).

2.4 The Nature of Procurement

In principle, construction procurement system is an amalgam of activities undertaken by a client to acquire a building. In this case, it is also well known as building procurement system. This term describes modalities or ways working and organisational structure used to obtain a building or constructed facility. Masterman (1992) also describes the term "building procurement system" as the organisational structure adopted by the client for the management of the design and construction of a building project.

The term contract including contract form and contract strategy is also widely used in the construction industry. This term reflects the need of formal agreement between a client and all parties involved in construction procurement. However, the term procurement strategy has synonymously same meaning with contract strategy. The word procurement strategy means any appropriate ways of procuring. Smith (1998) describes the term contract strategy as "the main components of the process used to determine how the project will be procured". The development of a contract strategy for any project should be based on a thorough assessment of the choices available for the implementation and management of design and construction process.

In principle, a construction project can be procured by clients in a very simple contractual form even only based on a simple letter agreement, or even through an oral agreement.

However, in this modern age, construction project can be very complex and involved large scale of resources, as well as risks exposure to project participants. Clients therefore need to provide and make a comprehensive and structured approach of procurement and contracting. Selection of procurement system is a critical matter to be addressed by the client. Hall (2000) asserts that some clients are wasting vast amounts of money and experiencing long delays because they are not educating themselves on how to choose the right method of procurement. For instance, some clients in the UK are using JCT contracts even if it is not the most appropriate approach to procure their project (Hall, 2000).

Clients can select an appropriate form of contract for the project by using a number of approaches. In general approach, the client has to define project requirements. In this case, project objectives, constraints and risks affecting the project have to be identified and prioritised. If the client has lot experiences of similar project procurements, he can make selection of an appropriate form of contract based on his experience. However, he has to consider t the risks involved. In other cases, procurement system is selected as a mandatory requirement imposed by the funding organisation or other stakeholders with significant interest in the project. The selection of an appropriate procurement system is usually based on key procurement criteria arising out of the client's requirements for the project (Love, Skitmore and Earl, (1998); Masterman, (1992); Chappell (1991); Franks, (1990); Skitmore and Marsden (1988); and NEDO (1983). The selection of procurement system and form of contract involves determination of requirements by clients and procurement criteria. The client's requirements and procurement criteria of the project are essential in selecting a suitable and optimal choice of a procurement strategy. These two aspects are commonly used in the procurement selection process.

Many researchers have suggested that clients need to consider risk allocation/ avoidance and proposed the use of risk analysis to determine appropriate procurement strategy for engineering projects. Hayes et al (1987) suggested that the development of a procurement strategy for a project must be based on choices about how to respond to risks. Hibberd and Basden (1996) also suggested that a contractual arrangement initially should be selected so as to take into consideration how risk will be transferred between parties, therefore determining the nature of the procurement method adopted to fulfil the client's objectives. In essence, Hibberd and Basden (1996) also suggested that risk is the prominent criterion that will determine the selection of a procurement method. However, Murray et al (2002) argued that the adoption of formal risk management framework on the projects would not prevent the projects being exposed to the project staff errors.

The procurement strategy governs the links of which participants' organisations establish with each other on a project by project basis and, within the framework of that strategy, by the contractual relations chosen by the client, which is known by the 'Contract Strategy'. Although these different organisations come together to form temporarily a project team, they are still fundamentally independent of each other. If they are not in harmony with those of other participating organisations, they can disrupt the working of the project, hence creating a management problem (Davidson and Mohsini, 1987; Davidson, 1989). Therefore, choosing a procurement strategy is of important step since it will affect all aspects of procurement process.

The contract or procurement strategy may consist of a set of strategic decisions taken upstream of each individual project. One of the strategies is to select an appropriate

procurement method suitable for the project. Finally, the procurement process will offer better value for money to clients and parties involved and the project participants can work as an effective project team for designing and for constructing an intended constructed facility. Therefore, a selected procurement method should be seen as a key set of important decisions. It must be planned properly, and it requires the participation of high-level decision makers. Uff and Clayton (1986) suggested that the major elements, which make up a procurement system, are the way in which the contract work is defined; the method by which an acceptable tender is obtained; and the placing and definition of responsibility.

Success of any team or group in any situation is the ability to work together as a team. In construction industry, success is more difficult to achieve due to the fragmented nature of the production process. The concept of 'partnering' is a fresh and positive concept trying to minimise the 'adversarial' or 'blame-culture', which the industry is suffering from. Rowlinson & Mathews (1999) cites the definition of partnering as advocated by the Construction Industry Institute of the USA in their report 'In Search of Partnering Excellence' which was formulated after studying 27 partnering case studies in the USA as: "*...a long –term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisational boundaries. The relationship is based on trust, dedication to common goals, and an understanding of each other's individual expectations and values.*" Partnering can also mean emphasising the maximisation of effectiveness or shared resources, a shared culture and trust and common goals.

As with the definitions and principle above, procurement consists of whole processes of acquiring thing or getting things done. In the procurement process, the interrelation between players of the construction industry and its clients is required. They are known as project participants. Procurement process should include a clear description of the roles of the participants, the relationships among them, the timing of events, and the practices and techniques of management used. The procurement process in construction consist of the whole process of acquiring construction projects, which can occur at the functional or departmental level as well as the project and organisational levels depending on the nature of the procurement. At the project level, the procurement process spans the whole life cycle of a project from initial project concept and definition of the client's requirements and project objectives through project planning, design and construction to the end of the functional and economic life of the asset or end of a services contract.

In this research, the procurement process include the procedures, systems, and activities, strategy and method to establish the contractual and organisational framework for project participants through which the project can be appraised, managed, planned, designed, constructed, and commissioned. The term procurement process and procurement policy are used in this research to address stages required to deliver activities by project participants for acquiring construction project as clients' expected and particularly health and safety.

The selection of appropriate procurement process is crucial to the attainment of the client objectives with respect to time, cost and quality. The needs of the clients are of paramount importance, particularly with respect to the implementation process. The model established by

the Public Works Department of Malaysia (PWD) or Jabatan Kerja Raya (JKR, 1992) Malaysia, is to provide guidance for implementing public sector development projects. The PWD is the principal body that implements public sector development projects in Malaysia. The model contains elaborated details outlining the design and supervision functions of the PWD, Malaysia:

1. Development plan and approval
2. Funding
3. Preparation of project brief
4. Land acquisition
5. Site survey, site and soil investigation
6. Preparation of preliminary design and site layout plans
7. Detail architectural and/or engineering designs
8. Preparation of the preliminary estimate and exercising of cost control
9. Preparation of tender documents
10. Invitation and receipt of tenders
11. Evaluation and acceptance of tender
12. Preparation and signing of the Contract Documents
13. Supervision and monitoring of progress of work
14. Extension of time for completion
15. Imposition of Liquidated and Ascertained Damages
16. Determination of contractor
17. Completion and handing over of work completed and making good of defects
18. Nomination of sub-contractors and suppliers

19. Administration of payment and

20. Preparation of valuation work and the Final Account

The process model by PWD covers all aspects and can be used in private projects as well. Those are the procurement processes models normally adopted in private or public projects. Basically, parties involved and structure of the industry is similar to the industry in the UK. This is due to the fact that Malaysia was colonized by England and at most of the procurement methods were adopted from the UK. The main participants in the Malaysian construction industry are therefore similar to those in the UK; the architects, the engineers, the quantity surveyors, the contractors, the clients and the financial sponsor.

The methods of procurement prevailing in Malaysia are the traditional method, design and build and management contracting (Hashim, 1999). A study of the types of procurement methods used by clients in Malaysian construction industry was conducted by Ismail and Samad (1999) and they found that 71 % clients used the traditional method, 21 % used design and build and 8 % used management contracting.

2.5 Procurement as a Policy Driver

The client's needs are of paramount importance in the overall implementation of a project. The philosophies adopted by major clients to implement their projects need also to be considered because they are likely to affect substantially, the project culture and the ways in managing the projects. The Latham Report (1994) suggested that a client's needs are:

- Obtaining value for money;
- Ensuring the project is delivered on time;

- Having satisfactory durability;
- Incurring reasonable running costs;
- Being fit for its purpose;
- Being free from defects on completion;
- Having an aesthetically pleasing appearance;
- Being supported by meaningful guarantees.

Bennett and Flanagan (1983) defined client's requirement as:

- A functional building, at the right price;
- Quality at the right price;
- Speedy construction;
- A balance between capital expenditure and long-term ownership costs;
- Identification of risks and uncertainty associated with the projects;
- Accountability, particularly in the public sector;
- Innovative design/high-technology buildings;
- Maximisation of taxation benefits
- Flexibility to enable design to be changed;
- A building which reflects the clients activities and image;
- Minimisation of future maintenance;
- The ability to keep any existing buildings operational during the construction period;
- An involvement in, and a need to be kept informed about, the project throughout its life.

Chapter 2: Research Context: Building Procurement

The government as a major client in any economy remains an important factor to create positive changes in the construction industry. Its construction procurement policies have considerable direct influence on local government as well as indirect effect on the private sector. Resulting from the Latham Report (1994), the government of United Kingdom, is in process of devising new strategy to ensure that government achieves world class standards in procurement activities. The essence of the strategy consists of the following key elements:

- Establishing best practise in procurement;
- Achieving best value for money;
- Defining departmental objectives and requirements and careful assessing of business cases, risks and contracts;
- Emphasising integrated procurement processes, covering the whole cycle of acquisition and use, to ensure quality and economy over time and not just the lowest price;
- Combining co-operation and competition into relationships with suppliers in order to promote continuous improvement and benefits sharing;
- The clients and the industry working together to maximise the chances of project success and to enable government to help the industry to be more efficient and competitive.

Procurement is therefore an important tool to achieve the client's objective. These objectives will have impact on the choice of procurement process. Government can use procurement as a tool to achieve national policies. The size of the government markets means that they provide significant opportunities for the government to have impact on the country's economy. According to Gounden, (2000) the South African government spent R56 million or 13% of

GDP which represent approximately 30% of all Government expenditure in public spending for the 1995/96 financial year. Similar observations were made in the United Kingdom in 1984, where it was estimated that procurement by public bodies and associated public corporations accounted for 21.8% of GDP in the United Kingdom (Arrowsmith, 1995). Governments have traditionally used procurement to achieve certain objectives. Governments are in a very good position to be agent of change due to their extensive powers of procurement. According to Arrowsmith, (1995) governments have used procurement as a tool of policy in two ways:

- To promote industrial development, where the very size of the government markets means that they provide significant influence to the economy, and
- To be used as a regulatory tool to support social objectives, either as an additional mechanism to enforce existing legal obligations, or to encourage standards of behaviour beyond those required by law.

The South African Government used the public sector procurement as tools to achieve two primary objectives (Gounden 2000) as follows:

- To utilise public procurement as a vehicle to achieve specific socio-economic such as the promotion of targeted small and medium enterprises, enhanced job creation opportunities, skills and technology transfer, and the like
- The promotion of good governance within the sphere of public sector procurement.

McCrudden (1995) in his analysis of public procurement and equal opportunities in the European Union, highlighted five principles, socio economic, or political, functions which public procurement may be used to:

- To stimulate economic activities
- To protect national industries against foreign competition
- To improve the competitiveness of certain industrial sectors
- To remedy regional disparities; and
- To achieve certain social policy functions, such as utilisation of local labour and increased employment of the disabled.

The South African Government, realising the importance of its construction industry has come out with The Green Paper on the Enabling Environment for the Construction Industry (DPW, 1997) which sets out government's vision for an enabling strategy aimed at enhancing delivery, greater stability, improved industrial performance, value for money and the growth of the sector.

The South African Government's Green Paper also identified several enabling policy instruments that can be used. These include the following:

- Regulation
- Procurement Policy
- Human resource strategies within government
- Direct support, including financial support
- Institutional support

The principles and purpose of these policy instruments are:

- Be direct at facilitating strategic national development objectives
- Advance public and private sector partnerships
- Ensure adequate co-ordination through appropriate institutional arrangements
- Enable monitoring of programme performance
- Promote compliance and best practise

In the Malaysian context, the public sector procurement has been utilised to promote the economic development of its indigenous Bumiputra community. Since the construction industry is one of the important sectors that act as a catalyst for economic activities the Malaysian Government put extra attention in this sector. Under the New Economic Policy, which was introduced in 1970, the government is committed to assist the Bumiputra (the indigenous Malay) to advance in the areas of business and commerce. In the construction sector the policy requires that 30% of the total value of public works must be allocated to 'Bumiputra Status' contractors under an open tendering system (*Arahan Perbendaharaan* - Government Instruction No.7 of 1974). Construction firms with good records of accomplishment and having the following prerequisites, could on application, be granted 'Bumiputra' status, i.e.:

- Fifty –one percent of its equity held by Bumiputras
- Fifty-one percent of its management staff are Bumiputras; and
- Fifty-one percent of its workers are Bumiputras

A 'Bumiputra status' contractor is eligible to participate in bids for public works allocated for the 'Bumiputra status' contractors only. In Singapore, the government is looking into the implications of some specific relevant clauses in the standard forms of contract in use, in attempts to raise the construction productivity (Ofori, Chan 2001). The Australian government through its Australian Procurement and Construction Council has been seeking alternatives in procurement methods, designed to achieve breakthrough change in the construction industry (Kendley, 2000).

These are some examples of how governments have used procurement as tools to achieve national policies. The public sector purchasing power can encourage the industry to embrace reform and to operate in a manner that the public sector identifies as best practice.

Governments therefore have the opportunity and ability to promote the construction industry using procurement as the vehicle to achieve specific goals. Policies regarding the standard to be attained in government projects can be promoted through the procurement process. Policies regarding health and safety in the construction industry can be an important milestone to enhance the safety environment. The importance of health and safety has been emphasised by many authors.

A successful project should be measured in terms of cost, health and safety, quality and schedule performance (Hinze, 1997). It is unacceptable to have a project completed on time and within budget but with a fatality record. Levitte and Samelson reinforced Hinze's contention with: "Quality includes health, safety and productivity." Rodrigue and Jaselskis (1996) concluded that from their research with construction projects in the USA, it was found

that "...projects that were consistently behind schedule and over budget experienced a greater occurrence of recordable accidents." There are also numerous advantages of investing in health and safety. Tang et. al. (1997) maintained that investing in health and safety will result in an increase in health and safety performance. Bentil (1992) cited the findings by Du Pont Safety Services which concluded that construction firms that make health and safety a priority can reduce lost workday accidents by an average of 37% in the first year, and 10-20% each subsequent year.

The government can introduce the importance of health and safety in relation to overall quality and productivity of a project. The understanding of the impact of health and safety on the quality and productivity will trigger the interest of clients because the main objective is to achieve a successful project. Governments as influential clients have a direct impact on achieving policy that reflects the seriousness in taking care of the health and safety of workers in the construction industry. Client actions have direct impact on the health, safety and welfare of the construction workers as well as achieving value for money.

Clients have great influence on the overall success of a project. Clients have the moral if not legal duty to take reasonable care to ensure safety to all workers on construction site. They have to make sure that the contractors recognise their contractual responsibility to work in a healthy and safe manner. Due to the optimal interaction with designers or consultants, clients have great influence to encourage designers to recognise the importance of health and safety aspects of any particular project (Jeffery and Douglas 1994).

Furthermore, the client should realise that successful projects are those projects not only completed on time within budget and according to specification but also being done with due consideration for health and safety of the workers. The client is responsible to provide a detailed comprehensive brief for the design team. This is the most crucial phase to ensure minimum variations of design during construction phase where variations from the brief can be the catalyst that triggers a series of events from designer through to workers that culminate in a site accident (Smallwood 2000).

Client's pressure to complete a project due to commercial demands can be counterproductive and negatively effects health and safety because this will results in undue stress to workers in order to complete the job under pressure (O'Reilly et al 1994).In a survey done in South Africa by Smallwood (1998), he concluded that most clients give priority equally to cost and quality and only a minority gave priority to health and safety.

According to Smallwood (2000), majority of the South African general contractors when surveyed responded that the clients have great influence on their health and safety performance. This can be summarised as 72.7 % less accidents, 29.5% less rework, 25% increased productivity, and 25% reduced accident costs and 22.7% gain compensation insurance rebates.

The UK government realising the role of government in construction industry and the importance of promoting health and safety has made it a policy that all public procurement be based on 'Value for Money'. Value for Money is the optimum combination of whole life cost and quality to meet the user's requirement and since client's actions have a direct impact in

achieving this policy, they must demand that health, safety and welfare is given the highest priority (OGC No.10, 2000).

John Prescott, the former Deputy Prime Minister of Great Britain, in his foreword (OGS No.10, 2000), remarked as follows: "It is time to give new impetus to health and safety at work. I am committing the Government to show clear leadership as an employer, procurer and policy maker. I hope this will inspire others right across our diverse economy to commit to a new action and share in benefits of good health and safety management. I condemn the culture, which for much of last year resulted in two construction workers to be killed in each week and in one period of nine days, the death of five people. We owe to those we have failed in the past to succeed in the future and to make health and safety everyone's top priority."

In the Construction Procurement Guidance (OGC No.10.2000), the areas where the client can have the greatest impact on health and safety on construction projects are:

- The selection of suppliers (including advisers and designers) that have an established corporate commitment and demonstrable performance in respect of health and safety;
- The award to suppliers who have project-specific proposals for managing health and safety that clearly demonstrate a total commitment to zero tolerance;
- The adoption of procurement routes that involve, during the early development and design stages, those parties that will construct, operate, maintain (including cleaning) and use the facility;

- The use of open output performance-based specifications which give the relevant weighting to health and safety with other key drivers.

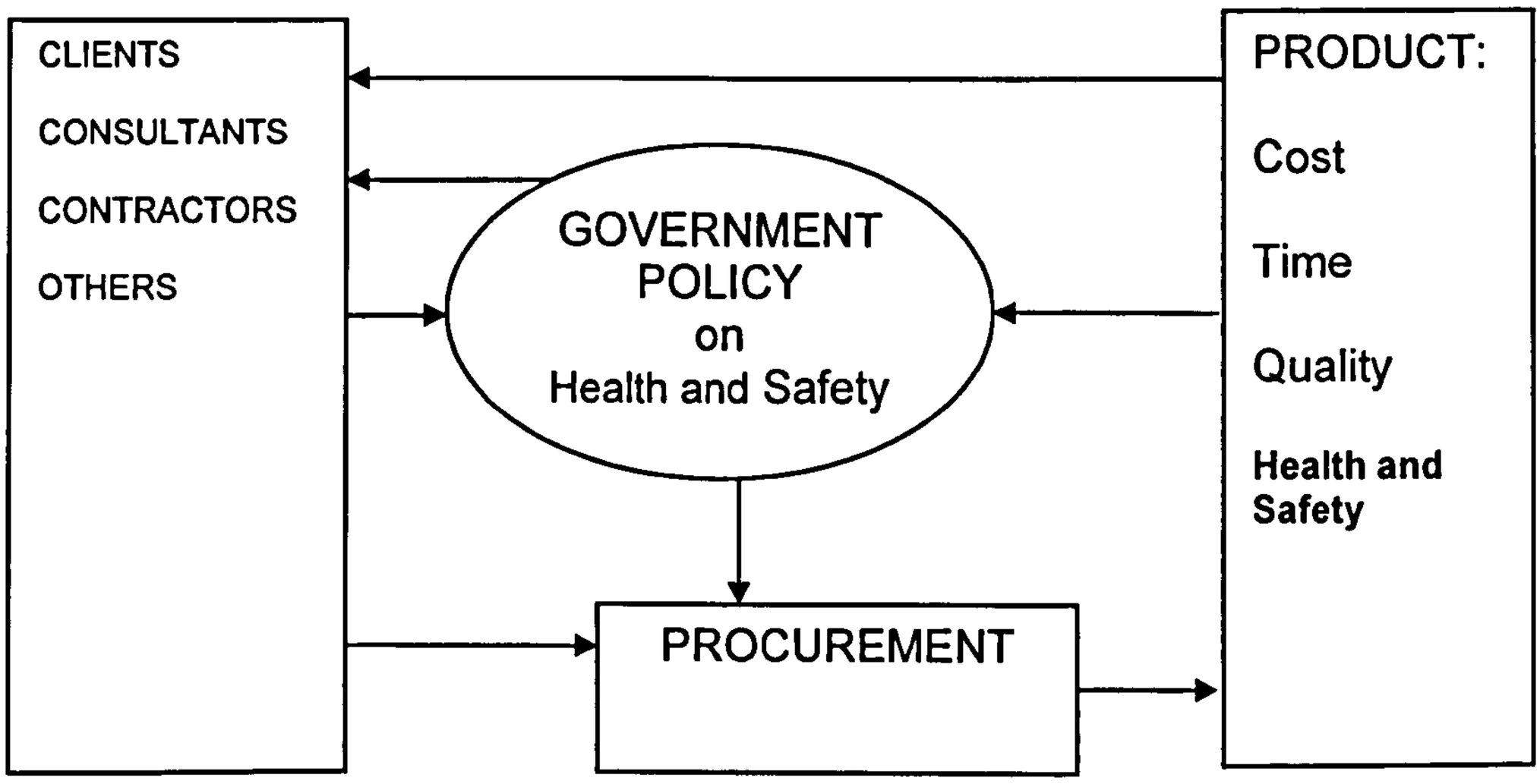

Figure 2.1 Procurement as a policy driver

The above diagram shows the policy on health and safety can be initiated by the government and the use of procurement as the driver of the policy to enhance construction health and safety. Procurement system is expected to yield product to satisfy the client. Health and safety is part of the total success of a project as discussed earlier and the government as one of the most influential client has an obligation to introduce policy regarding health and safety. It is important that all the players in the industry have the correct perception about health and safety. The understanding of the relation between health and safety and total successful project will drive the players to be more concerned about health and safety and through the procurement process they can contribute in many ways to enhance health and safety.

The close relation between the consultants, designers and contractors and the authority through public works can provide a suitable forum to encourage the government to have better policy concerning health and safety. The government too, as the biggest client can have a great impact on the designers and contractor to ensure they are particular about health and safety.

2.6 The Cultural Impact on Procurement

Cultural factors are all patterns of collective behaviour of the society that influence the project or the industry as a whole but which are impossible to control through individual project management. They are more or less preconditions and accumulations for the various tasks that can be shaped to execute projects. Ofori, (2000) argued that the impact of culture on a business economy attracts considerable attention in literature. The relevant written texts underscored the effect of culture on different aspects including business organisations, the construction industry and projects. Both Ofori, (2000) and Fletcher, (2003) agreed that culture affects the different aspects of the construction industry such as the management styles, team and individual relations, and leadership.

Culture involves relationships within and between organisations, resources and the environment within which work and project activities take place (Fletcher, 2003). Culture is defined as a historically evolved values and attitudes, which are learned and shared by the members of a given society, which influence their material and non-material way of life in interacting with each other and outsiders. These inherited and evolving values and attitudes are a starting point in any decision, where procurement of any projects also starts with a set of

cultural inputs to the decision maker and ends with the choice of a specific procurement approach.

Fukuyama (1995) argued that the ability of nations to compete is conditioned by one pervasive cultural characteristic-the level of trust in society. Trust was seen by Latham (1993) as the gatekeeper to any real progress in improving procurement and contractual relations in the U.K. construction industry.

Culture can be distinguished conceptually from social structure. Culture in this sense is restricted to meanings, symbols, values, religion and ideology. Social structure concerns concrete social organisations such as the family, clan, legal system, or nation (Fukuyama, 1995). The capability of communities to form new associations and to co operate, Fukuyama calls it "spontaneous sociability".

The potential for spontaneous sociability is dependent upon a network of social and political institutions and constrains as well as freedom. Hutton (1994), in identifying areas of weakness, argued that "the degree to which an economy's institutions succeed in underpinning trust and continuity is the extent to which long term competitive strength can be sustained". A major thrust of the Latham Review (Latham, 1994) has been the attempt to rebuild trust in the construction industry. This has been attempted both through the advocating of partnering at project level, and through encouraging the restructuring and realigning of the existing clients, contractors, subcontractors, suppliers and consultant institutions.

Intermediate institutions have been given a developmental role in establishing procurement policy and practice in both developed and developing countries McDermott and Quirn (1995), Ng Wing Fai (1994), Martins and Taylor (1996), Walker (1996), Allin (1990), and Ofori and Pin (1996). Ofori and Pin summarised the advantages of such intermediate institutions in developing nations since they encouraged the public sector to package projects in suitable sizes for participation by small, local contractors; the use of locally developed materials, and the formulation of contract procedures and documents, which are easy to use by the local industry.

The extent to which governments can artificially stimulate "spontaneous" sociability is debatable. It depends largely on the response of society to the credibility of their intentions. Hutton (1995) argued for constitutional reform and suggested that: "if markets require boundaries and rules of the game they must be set by public agency, but if such intervention is disqualified by the belief that any public action necessarily fails, and then the initiative cannot even reach first base. The State must act to assert common purpose". The direct involvement of governments in determining procurement policy and practice in construction has been documented by Aziz and Ofori (1996), Mustapha et al (1996.

The European Community (Atkins, 1994), in a proposal for a strategy for the European construction industries, put forward the fundamental thesis that "the characteristics of the construction process and its output are such that competitive market forces do not of themselves create an efficient industry". The report called for a legal and institutional framework which permits customers to choose from a range of procurement processes, and for an industry structure, which combines the flexibility of many small specialists and local

firms with a number of large worlds beating EC firm. Institutions to support improvements in the performance of sub contractors and the self employed are also called for.

The manifestation of trust in procurement and contractual relations in the construction industry depends largely on the host environment. This manifestation is a reflection of the cultural trends and altitudes of the individuals and organisations, for instance the presence of corruption in the client environment affects any contractor's approach to reach an agreement on the procurement path and the contractual strength of this path.

In general the construction industry is run and managed by science oriented people where cultural issues can be characterised as 'soft issues', which people can learn but take considerable experience and cultural interaction to master. Consequently, they receive less attention than 'hard scientific' issues such as planning, structural design and other issues, which can be learned and mastered in a lone environment.

In principal, most of the procurement systems the client, the engineer and the contractor constitute different organisations. In general the culture of the principal members will dictate the behaviour in the organisation. In most cases, members of different organisation are strangers to one another. The quality of interaction of those people is dependent on the cultural understanding and harmony of this relationship. The realisation of the effect of culture on the contractual relation between any project stakeholders and consequently the procurement system will help to resolve any disputes in the process of planning, designing and constructing the project.

The underrating of the impact of the cultural aspect in procurement will affect the quality of the procurement system. This is agreed by most authors, however some authors like Masterman (2002) argued that while the importance of the consideration of the cultural, managerial, economical and political issues should not be underrated, but they should be treated as a supplement of the project strategy rather than as an integral part of the procurement system. The inclusion of these aspects as supplements to the procurement system may not result in the desired output if the procurement is used as a policy or a policy tool. In this respect Arrowsmith (1995) identifies public procurement as a policy, by having industrial, economic and social policy objectives. And by this definition, these aspects should be integrated in the procurement system.

2.7 Performance of Building Procurement

Procuring constructed facilities, such as commercial buildings, industrial complex, and infrastructures required a large scale of different resources. In this respect, construction projects can be a complex process involving different background of participants and affected by various risks stemming from internal and external boundaries of project organisation. Therefore, the issues related to construction procurement can be related to project funding, government policy, market, project performance, contractual dispute, and health and safety.

Current global trend of market liberalisation has changed construction procurement worldwide. The market liberalisation has affected developmental goals worldwide. The conflict is evident in practice, policy and ideology of development across the globe. In the construction industry therefore, more emphasis has been predominantly on practice and policy of how procurement can produce value for money to the clients. In this case, the broader

developmental goals suggest that procurement systems should take into account more than speed, quality, price competition, certainty and risk transfer (Jackson and Price, 1995)

Privatisation, in its many faces, has been implemented, not only in Europe and North America, but also in Eastern Europe (through the transition from socialist to capitalist systems), and in Africa and Asia (through Structural Adjustment Programs). This takes into account concerning international comparability and the standardisation of contracts and contract procedures.

The procurement policy and systems therefore must be appropriate and suitable to the circumstances in the host environment. In these circumstances, the process of the procurement assumes status greater than it is normally afforded. The process related goals become as important as the product related goals. The green paper submitted to the South African Parliament in 1997 in the context of procurement reform suggested that the procurement should encourage appropriate, people intensive technology and processes, and also open the way for learning and skill development and in the socio-economic aspect, the establishment of a system that will meet the needs of the people of South Africa. In this case, the procurement should also ensure development towards a better South Africa for all its citizens.

Project performance in construction becomes the client's concerns not only on the basis of quality, time and cost but also safety and health. This corresponds to an environment of significant changes in the legal, economic and social structures of states in both developing and developed countries. In developed world, much attention is focused on narrower procurement and contractual relationships as the contract strategy. In U.K, for instance,

through a joint governmental industry review, the government was given a brief to consider current procurement and contractual relations and there is a need to examine the structure of the industry (Latham, 1994).

The adversarial culture of construction becomes current debate in the U.K. Review of current construction industry performance under the rethinking construction chaired by Sir John Egan endorsed initiatives, such as team integration, and partnering as a means to replace the culture of contentiousness and to rebuild trust among the industry stakeholders. The new procurement and contractual procedures have to promote and ensure all parties involved sharing to synergy tackling certain issues such as quality defect, cost overrun, delay and also accidents.

The introduction of other procurement policies and schemes occur in developed countries, such as UK. This procurement scheme may help achieve cost effectiveness of construction project developments. This scheme is mainly to enhance the performance of the public sector projects, and achieve a good value for money. This new procurement provides private sector to involve in the public procurements in the form of Public Private Partnership (PPP). This scheme is regarded as an output of the Private Finance Initiative (PFI) movement. In the U.K the Treasury Task Force for Private Finance described that the key objective of PPP is to provide value for money for the taxpayers.

In developing countries, it is very common that procurement is only perceived as a contractual relation between the client and the contractor and more narrowly regarded as a tendering system. Since the procurement system is only viewed as tendering procedures. The procurement policy is also influenced by the strong political factors. Therefore, the

procurement is seen as a choice of different contract strategies and they are bounded and controlled by the political system. The need of private funding in the some developing countries has changed the traditional ways of working of national government procurement control. This also drives by the private clients as the main financers of many infrastructure development projects. The government status has given more opportunities to private sectors to become involved in public procurement. Therefore it has changed the procurement perspective and approach of the infrastructure projects by the introduction of the BOOT concept, joint ventures and other partnering mechanisms.

The construction industries, in both in the UK and Malaysia have many similarities due to the historical factor. Since Malaysia was previously part of the British Empire, the configuration of the industry in both nations resembles one another in the overall structure. Chong (1990) commented that due to the colonial heritage of these nations and their relationships with the United Kingdom, there are "continuing links especially in education and professional affiliations, which have great influenced and ensured the similarities in the procedures and practices in both countries public and private sector." Therefore the main players or participants of the Malaysian construction industry are similar to those in the UK including; the client, the architect, the engineer, the quantity surveyor (or consultants), the contractor and the financier.

Basically there are two types of clients in Malaysia, simply, the public client and the private client. The Government has played a major role in the development of the country through the Five Year Malaysia Plans, which started from 1964. Since independence in 1957, the

Government has played a major role in the development of the entire necessary infrastructure for the nation.

As with the identified problems, this research concerns with the enhancement of safety practices in the construction industry. Other related issues identified are low quality, low productivity, which are crucial in the development of the industry. The relationship between safety, quality and productivity has to be highlighted in order to give some degree of realization to the main players in the industry. The Malaysian government as the main client to the industry can play an important role in the development of the industry. The role of the government as an agent of change is well understood due to the unique position as a main client in any economy. Through public procurement as policy tool, government can and has made important contribution to the social and economic developments of a country. It is hoped that more serious focus will be made to enhance safety culture in the industry through public procurement system. Focus will be on the players in the 'up-stream' of the construction process i.e. the clients and designers. Special attention will be on the government as an important and influential client. It is also important to convince all parties that investing in safety is morally and economically profitable. At least investing in safety will improve the bad image and will attract more people to work in the industry.

In the Malaysian construction industry, three different standard forms of contract for construction have been established. Those standard forms of contract are PWD Standard form of contract, PAM 1998 standard form of contract and CIDB standard form of contract. The newest standard form of contract was developed by the Malaysian CIDB and well known as the CIDB standard form of contract for building works 2000.

In relation to health and safety, this standard focuses on safety at the site and responsibility on safety matters is under general obligation of the contractor. The safety at the site conditions includes compliance with safety requirements, submission of safety programme, safety office and personnel, and safety measures. In this case, the contractor will take responsibility for adequacy, stability and safety of all operations and methods of construction. The contractors need to comply with all safety laws and regulations as well as orders and directives from superintending officers. The contractors also need to submit a safety programme within 14 days of the letter of award to ensure all construction operations are under safe manners and in compliance with the safety requirements. In this standard form of contract, the contractors are required to appoint a safety officer and personnel and provide safety training programmes for all workmen including the workmen of sub-contractors. Under the safety at the site conditions, the contractor has the responsibility to conduct safety measures on the construction plant, tools and equipments as well as temporary works. The contractor in any case has to provide at his own expenses all safety equipments including but not limited to safety boots, safety helmets and personnel protective equipments.

2.8 Project Team in Building Procurement

Project team in the building procurement varies according to procurement system adopted. In general, many parties can involve in the building procurement, for instance clients, contractors, designers, subcontractors, quantity surveyors and others. Clients are the key player in the procurement process as initiators, financiers and end users of the construction products (Latham, 1994). In many countries, particularly developing countries, such as Malaysia, government is a client who predominates in the construction industry. However, at

present, private sector has also been regarded as potential client of the industry as private sector may not only consist of single agents but many. It is, therefore, more parties are been involved in the building procurements and with different methods they use. It impacts on changing contract terms, the need for speed of delivery, and complex arrangement, including competitive tendering, and contractual systems. However, government as a major client can provide big effects on the construction industry both directly and indirectly, such as decisions by government that affect investment plans and incomes.

The client's needs are of paramount importance in the overall implementation of a project. The philosophies adopted by major clients to implement their projects need also to be considered because they are likely to affect substantially, the project culture and the way in managing the projects.

The government as a major client in any economy remains an important factor to create positive changes in the construction industry. Its construction procurement policies have considerable direct influence on local government as well as indirect effect on the private sector. Resulting from the Latham Report (1994), the government of United Kingdom, is in process of devising new strategy to ensure that government achieves world class standards in procurement activities. The essence of the strategy consists of the following key elements:

- Establishing best practise in procurement;
- Achieving best value for money;
- Defining departmental objectives and requirements and careful assessing of business cases, risks and contracts;

- Emphasising integrated procurement processes, covering the whole cycle of acquisition and use, to ensure quality and economy over time and not just the lowest price;
- Combining co-operation and competition into relationships with suppliers in order to promote continuous improvement and benefits sharing; and
- The clients and the industry working together to maximise the chances of project success and to enable government to help the industry to be more efficient and competitive.

In the building procurement, the clients cannot work in isolation. There are many members of project team who work as the procurement in progress. Engineers and architects including quantity surveyors are among others who are usually called as client's team or consultants. In general, the engineers and architects will involve in the design and supervision of construction projects. The engineers in particular are responsible for the structural design while the architect will be responsible for designing the building. The quantity surveyors produce the tender documentation, bill of quantities, tender evaluation, cost management, the whole of process of cost monitoring and cost control during construction and dealing with final account at the end of the project. In the case of Malaysia, the architects hold the key role in the building process as the project leader who can cooperate with other consultants such as engineers and quantity surveyors to effectively implement the procurement process (Yong, 1986). Furthermore, Alcock (1994) asserted that in Malaysia, architects are predominantly involved in establishing the project brief and conceptual design, and taking account of clients' needs.

The function of quantity surveyors as cited by Willis and Ashworth (1987) is primarily to undertake economic evaluations of projects, contribute to legal interpretations and applications, influence the technology relating to material and methods, and provide managerial and financial functions in terms of construction procurement and administration. The quantity surveyors also advise clients regarding the types of procurement system, project duration and the selection of contractors. The preparation of contract documentation and bill of quantities is also part of their expertise. The type of procurement system selected is important because procurement is a strategy to achieve client's objectives, and it has a direct impact or relation to health and safety which is one of the important components of a successful project.

In the building procurement system, contractors are the key player of the construction industry. In many countries, the number of contractors are dominant than other players. The British construction industry consists of around 200,000 companies ranging from very small to very large contractor (Peckitt, 2000). In many countries, the largest contractors are usually big organisations with employing large number of skilled and well educated people. They can then dominate construction market in term of contract value they obtain. Peckitt (2000) quotes that the large contractors can be family owned company or they are part of a larger holding company and are often subdivided into decentralised units specialising in particular construction jobs such as plant hire, foundation works, concrete and roofing. However, even in larger contracting firms, safety management system is limited to achieving minimal legal requirements and company personnel departments tend to restrict their involvement to giving advice on employment law and industrial relation (Drucker and White, 1995). Furthermore,

Peckitt (2000) specifically mentioned that smaller contractors who dominate the construction industry rarely pay attention to formal training qualifications, safety training or site safety induction tasks. Informal recruitment practices predominate with workers often gaining work through friends, in pubs, and by walking onto sites. Site managers hire and fire workers as a project develops resulting in high labour turnover and a lack of loyalty to employers. In the construction industry, subcontractors, supervisors, workers often have to sort out how to execute the work. Skills, knowledge, and resources are often limited at this decision making level, reducing the effectiveness of risk management. The one-off nature of most projects, use of subcontracting, and lack of worker loyalty, create a challenging environment in which is difficult to manage (Peckitt, 2000).

2.9 Summary and Conclusion

In Malaysia, procurement systems and methods are adopted from the UK since the influence of British colonisation. The traditional procurement method is mostly used by many clients in Malaysia. Few clients use design build and management contracting. The government has also used the public procurement process as a policy instrument, particularly to give a business privilege for indigenous "Bumiputra". However, no attempts have been made to utilise the procurement process including standard forms of contract as a policy instrument to enhance health and safety practices in the construction industry. Therefore, it is worth to explore the improvement of procurement process for better implementation of health and safety. The next chapter addresses the state of the art of health and safety in the construction industry.

CHAPTER 3: RESEARCH CONTEXT: CONSTRUCTION SAFETY

3.1 Introduction

The International Labour Office (ILO) (1995) distinguishes construction from manufacturing on the basis of the following characteristics: high proportion of small firms and of self-employed workers; the short life of projects; the high turnover of workers; the large number of seasonal and migrant workers, many of whom are unfamiliar with construction processes; exposure to the weather and the many different trades and occupations.

In many countries the industry is an important sector of the economy and its role in the development of a country is very significant. The difference between the construction industry and manufacturing industry as highlighted by ILO sets a scenario for this research. The study focused on the health and safety issue of the industry, which has direct relationship with quality and productivity of the industry. The involvement of all parties relating to health and safety was scrutinised all along its production process. The role of the government as the client, its policy towards health and safety, leadership quality with other players, integration of all parties is the key issue in this research.

Construction safety can be influenced by many factors in different forms and nature. Those factors can be justified in different way of categorisations from micro to macro levels. This chapter also discusses factors affecting the construction safety in term of procurement related 1issues, such as, committed clients, project team integration and the nature of procurement

process itself. This will build the theory underlying the research and the basis of propositions or a model to be tested. In this case, a model to be tested is concerned with how procurement process in which client leadership and project team integration can enhance safety practice.

This chapter reviews safety in construction. This chapter addresses safety perspectives, including understanding accident causation in construction, safety issues in construction and safety improvement strategies. In this chapter, the role of project participants related to safety matters is also highlighted. This may help in identifying research context and proposition.

3.2 Safety Issues in Construction

In many countries, the construction industry is labelled as one of the most hazardous place to work. Health and safety has become a major issue of concern of government and society. Most publications on construction safety issues suggest that the industry has been recognised as among industries having high likelihood of accidents (e.g. Hinze and Applegate, 1991; Adrian et al, 1994; Alves Diaz, 1996, Khalid, 1996; Suraji, 1997, Rowlinson, 1997). The UK's Health and Safety Commission (HSC) revealed that the incidents in construction in 1996/97 data was eight times the average for all industries. Snashall (1990) cited, on average, five construction workers were killed every two weeks and one member of the public was killed every month by construction activities in the UK. In the EU, 67% of workers in the construction sector believed that they were at risk of having accidents (Commission of European Communities, 1992). This phenomenon is a global issue and both the developed and developing countries are struggling to solve this problem. In the developed countries new legislations have been introduced in recent years and shown substantial improvement in the

accident records. Caldwell (1999) reported that in early 1960's the number of workers killed in construction every year was around 275. By 1970 it was around 200, by 1980 around 135 and by 1990 around 100. For 1997/1998 the fatal accident figure was 74.

Both the public and private sectors realise this is a bad phenomenon and therefore serious thought is required to improve the situation. The Confederation of Construction Clients (CCC) of United Kingdom (Construction Procurement Guidance, No.10, OGC, 2001), in its commitment to work together to improve performance on construction sites in terms of health and safety, productivity and quality, has set target to reduce the:

- Incidence fatalities and major injuries by 40% by 2004/2005 and 66% by 2009/2010;
- Incidence rate of cases of work-related ill health by 20% by 2004/2005 and by 50% by 2009/2010; and
- Number of working days lost per 100,000 workers from work-related injury and ill-health by 20% by 2004/2005 and by 50% by 2009/2010.

Construction industry plays an important role in providing constructed facilities, such as: buildings, housings, industrial complex, roads, dams, drainage systems and others. The scope of the industry gives a wide variety of activities involved. The involvement of large scale of human resources and skills is obvious. In relation to health and safety, various authors referred to the uniqueness of the industry as a basis of argument or comparison with other industries. The nature of the industry, being highly fragmented, gives great challenge in

regards to team integration, communication, client's leadership with will have great impact on health and safety.

Griffith (1995) when making comparison cited the following nature, such as the temporary nature; the transient workforce; competitive tendering; inclement weather; the inadequacy of legislative requirements; the labour intensive nature; the high level of subcontracting; the long working hours, and elevated heights. Hinze (1997) cited that the diverse skills required; the outdoor nature, and the ever changing nature, mix and location of the work. Hinze (1997) also asserted that the changing environment makes health and safety in construction more challenging as opposed to an excuse for lower standards than in manufacturing.

The "uniqueness" of the industry as compared to other industries has always been the topic of analysis, Chan and Chan (1996) referred to the "one-off" nature of the product; diversity of products, the varied environments and the number of organisations involved. The 'uniqueness' can be argued as an answer to the question of why the industry is lagging behind other industry in terms of quality, productivity and more relevant to this research the poor record regarding health and safety.

The uniqueness of the industry is always cited as one of the reason contributing to the low standard in term of health and safety as compared to other industries. But it can also be a focal point to start looking at other industries and valuable lessons can be learned to improve health and safety. The UK Task Force (Rethinking Construction, 1998) was set up to look into this issue. It quotes that "we see that construction has two choices: ignore all this belief that

construction is so unique that there are no lessons to be learned; or seek improvement through re-engineering construction, learning as much as possible from those who have done it elsewhere"

The UK government is accepting the uniqueness of the industry but does not accept it as an excuse to be complacent in the issue of health and safety. On the contrary, the UK government accepts it as a challenge and has clear and specific target to improve the situation by introducing various initiatives, which will be discussed in other chapters. The uniqueness of the procurement process of the construction industry can be seen from the fact that there are many parties involved right from beginning of the process. Those involved can be normally classified as the client, the designers and the contractor. Those involved have different knowledge, experience and roles to play in the production process and this make it more difficult and challenging to have a synergy of objectives. Clients obviously are the most important player to ensure the achievement of the project objectives. The clients should have clear set of objectives to be achieved so that the other team members have clear target and level of achieving to work for. If the client understands the importance of health and safety in the overall success of a project and make it clear from the beginning of a project then the other players will be obliged to follow.

3.3 Safety as a Factor Affecting Project Performance

The question of construction safety has to be the same as the quality of construction. In the pursuit of the construction development in order to achieve Vision 2020 in Malaysia, the challenge to reduce the accidents on construction site will be of an important consideration. If

the government can be the important enabling agent to ensure the growth of the industry, it will be only morally right to ensure the safety of thousands involved in the industry are taken care of.

Rashid (1998) revealed that efficient procurement of construction projects is vital for Malaysia in its quest towards meeting the objectives of Vision 2020. In his study he highlighted constraints which are likely to affect the effectiveness and efficiency of the procurement process. These constraints will have adverse effect on the construction output. Since safety is also an element related to the overall success of a project, a study of the existing procurement process that relates to safety issues is important. Safety should be part and parcel of the construction output. Rodriguez and Jaselskis (1996) stated in their study that projects that were consistently behind schedule and over budgeted experienced a greater occurrence of recordable accidents. It also shows that productivity can be improved with fewer occurrences of accidents on construction sites. In the context of the Malaysian construction industry which emphasis on targeting a steady growth, it is important to ensure that safety record is favourable or simply, positive growth of the industry should have negative figure in term of accident figures. Among the relevant questions that should be considered are as follows:

- What is the impact of the existing processes of construction procurement on the implementation of construction safety policies?
- What are the constraints that can hinder the improvement of construction procurement to ensure better safety record?

- What are appropriate strategies that could be implemented to remove the identified constraints?

As with Latham' report on rethinking construction, one of the five key drivers of change is an integrated project processes and teams. It is now realised that the fragmented project processes and teams will not help in improving the quality and efficiency of the industry. As mentioned in this report that "the rationale behind the development of an integrated process is that the efficiency of project delivery is presently constrained by the largely separated processes through which they are generally planned, designed and constructed. These processes reflect the fragmented structure of the industry and sustain a contractual and confrontational culture". The integrated project processes and teams will need a sharing to synergy approach for the sake of improving performance of the industry. How this approach affects the safety issues described above needs to be addressed.

Sharing responsibility for implementing health and safety on that ground is required to respond the fragmented project processes and teams occurring in the industry. The key driver is that a descent and safe construction process should be any concerned of all project participants involved. Following this, a zero incidence is set as a strategic target for the construction project implementation. These can be achieved when all project participants are keen to improve their commitment for improved operative safety. Dester and Blockley (1995) asserted that "it is reasonable to suggest that management practices, including lack of leadership, lack of commitment, and lack of action are management manifestations of employee unsafe behaviour". Improving committed management for construction safety

should be extended from construction process only to project design and project conception or inception. Therefore, designers, clients and the client's project team must also incorporate safety matters into their duties and responsibilities. The concept of design-construction integration (e.g. Tatum, 1987a, 1987b, 1990) needs to be expanded by incorporating project inception into the design-construction integration approach. This concept will suggest that any matter of construction project, including safety should be addressed since in the beginning of project inception, design and throughout project development process in which there should be knowledge sharing between the project participants.

It is important to understand and appreciate the importance of health and safety and its relation to overall success of a project. With this understanding only then all parties involved will put in more efforts to make a project safer to implement. Discussion about the need and justification for health and safety can be best start with a quotation by Hinze (1997): "Safety is no luxury; it is a necessity."

Accidents represent not only human tragedies but also substantial economic cost. This can be summarised as direct and indirect costs. Direct costs are those most visible and actual costs attributed to injuries and fatalities. This includes items such as medical care, doctor's fees, hospital fees, workers compensation benefits, insurance premium liability and property losses (Hinze, 1991).

Indirect costs or hidden costs are more difficult or sometimes almost impossible to quantify (Hinze, 1991). They include the costs of items such as replacement of damaged work or

equipment, cleanup. Legal fees, loss of productivity, disruption of schedules, administration time for investigating and reporting, training of replacement personnel, wages paid to the injured workers and others for time not worked, cleanup and repair, third party liability claims and equipment damaged (Everett, 1996; Bentil, 1990).

There are a few other reasons for investing in health and safety. Many authors have written about the need for health and safety. Mere (1990) cited the human aspects of the subject; legislative requirements; financial penalties in the form of fines when contraventions are successfully prosecuted; the financial benefits accruing from health and safety; client pressure; the attitudes of the courts, and sustainability of the 'green' environment.

Fryer (1997) referred to the nature of the industry itself, whereby construction sites are normally very dangerous with all kind of activities involving big machineries and related activities like demolition; structural and steel erection, painting and decorating at high levels. Trying to work according to schedule gives pressure to workers and this will increase risk of accidents happening. Burgers (1996) argues that a healthy and safe environment and healthy people are essential to profitable product. The poor image of the industry due to high accident rate makes it 'unattractive' options for career seekers. The high turnover and shortage of manpower in the industry is being experienced not only in developed but also in developing countries. The industry has to rely on unskilled foreign workers, which add up the difficulty in addressing the health and safety issues. The Business Roundtable (1991) stressed on the need for health and safety by referring to the negative impact of accidents has on an organisation's image and public relations effort.

The cost of accidents is an important factor and frequently cited as a major motivation for investing in health and safety (Hinze, 1997; Levitte and Samelson, 1993; Rowlinson, 1997; Leslie, 1993; Meere, 1990). Hinze (1997) concluded that inadequate health and safety affects cost as a result of accidents. The Business Roundtable (1991) estimated that the total cost of accidents is about 6.5% of the value of completed construction. Anderson (1997) estimated the cost to be 8.5 % of tender price. Smallwood (1996) concurred that the lack of health and safety indirectly affects the cost as a result of damage to the environment, reduce productivity, quality and achievement of schedule requirements.

Unless and until all parties realise the relationship between health and safety as well as quality and productivity, they will never appreciate the importance of investing in health and safety. Health and safety must be part and parcel of the whole production process and is the responsibility of all parties in all the stages of the process to ensure that all considerations have been taken in relation to health and safety.

Smallwood (2000) cited the definition of TQM given by The Association of General Contractors of America (AGC) in 1992 as: "A continuing process of improvement involving all aspects of the business." Levitte and Samelson (1993) stress that TQM has as its main thrust continuous improvement in health and safety, productivity, quality, and employee and clients satisfaction. Levitte and Samelson (1993) further explain that the TQM mission is the linkage of the processes, which deal with health and safety, productivity, quality and satisfaction, with the real benefit being the synergy between them. Smallwood (2000) cites three key principles according to AGC on which TQM is based on:

- Customer focus: a contractor has both internal and external customers (clients) whose requirements need to be identified and met first time and every time. As all work is a process, internal customer satisfaction at each step is prerequisite for external customer satisfaction which impacts on, among others, profit.
- Process improvement: continuous improvement of the steps necessary to execute work will reduce the variability of the output, and ultimately result in zero -defect.
- Total involvement: participation of all contributors by empowering all employees to improve their outputs by identifying and solving problems, improving processes and consequently satisfying internal and external customers. Suppliers and sub-contractors need to be included and become partners.

There is evidence of relationship between health and safety, productivity and quality. Smallwood (1996) found many aspects affected by inadequate health and safety. In his research, some project managers in South Africa were asked to determine to what extent that the aspects, such as cost, environment, productivity, quality, schedule, and client perception affected by inadequate health and safety. Table 3.1 shows responses from the project managers towards how health and safety can influence those aspects of construction project development.

Table 3.1 Aspects affected by inadequate health and safety

	Aspects	**No Response (%)**
1	Cost	72.3
2	Environment	66.0
3	Productivity	87.2
4	Quality	80.8
5	Schedule	57.4
6	Client perception	68.1

(Smallwood, 1996)

There are other studies to relate between health and safety, quality and productivity. Productivity is always linked to motivation because highly motivated worker is generally very productive. According to Price (1992), a construction worker's physiology and health and safety needs to be satisfied prior to mobilisation of the main motivation needs: affiliation, esteem and self actualisation.

In another study conducted by Wilson (Price, 1992) to determine the needs which influence a construction worker's motivation, respondents ranked 'physical/ safety/ working conditions' first. A study conducted by Lim (1993) to determine the factors that influence labour productivity, respondents stated that managers and supervisors should possess an interest in the welfare of workers which includes, among others, facilities and health and safety in general.

According to Krause (1994) behaviour based safety management and quality improvement are "essentially two sides of the same coin". This author defended that eight principles of continuous improvement find direct application on behaviour based safety management:

- Having constancy of purpose;
- Implementing a process, not a programme;
- Doing right the first time;
- Not blaming the employees;
- Specify standards in operational terms;
- Using measurement of upstream factors to assess performance;
- Improve the process, not the downstream results; and

- Using statistical techniques to distinguish common cause variation from special cause variations

A safe working behaviour must result from having the adequate means, knowledge and motivation. Smallwood (2000) asserted that a research in Thailand by Ogunlana and Chang in 1998 and among the findings showed that based on cross-analysis of motivators, safety was ranked third by both supervisors and workers. According to Blewitte and Shaw (1997) 'health and safety' is one of the areas that 'best practise' organisations focus on. They attribute this to the organisations having recognised that health and safety can contribute actively to improvements in morale and productivity.

The Business Roundtable of USA (1993) had conducted a survey involving 8 projects employing a total of 6,973 workers and investigated the reasons for absenteeism and turnover and the result showed that out of the total 1005 respondents, unsafe working conditions and excessive rework ranked first and second. A research has also shown that behind schedule projects and overrunning budget had higher recordable accident rates than projects meeting schedule and budget. Falling behind schedule will result in an increased production effort, which increases the chance of accidents (Rodriguez et al., 1996). Hinze (1997) found that supervisors who meet schedule also realise the best health and safety performance. Smallwood (1995) concluded that project duration can influence the performance of health and safety because a shortened contract period invariably results in an increased number of workers, the number of working hours per worker, or even a combination of the two. Due to shortened period, extra plants and equipments are likely to be introduced and this will add to

higher risk for the workers on site. The additional numbers of sub-contractors will also be another factor for the higher risk.

On a survey undertaken on 252 general contractors in South Africa, Smallwood (1996) cited some important findings. Over 56% of the contractors agreed that health and safety were negatively affected by short project periods. The contractors identified 'general pressure', 'less time per activity' and 'more workers' as the main reasons for this phenomenon.

3.4 Safety: Definition and Principles

The Concise Oxford Dictionary of Current English quotes the terms occupational, health and safety. The term occupational is defined as "of or in nature of an occupation", and "(of a disease, hazard etc.) rendered more likely by one's occupation." In this dictionary, health is defined as "the state of being well in body or mind," and "a person's mental or physical condition.", and term safety is described as "the condition of being safe; freedom from dangers or risks." Smallwood (2000) consolidated the above definitions and comes out with "Occupational endeavours to ensure employees' freedom from danger, disease and risk thereby preventing from marginalisation of their mental and physical well being as a result of work process."

The above definition covers the meaning of health and safety in the construction industry. It covers the total welfare and safety of the workers in the industry. Health and safety of workers is an important consideration not only in the construction industry but also in all industries. It is the moral and legal duties of all employers to ensure that their employees are safe in their working environment.

The safety definitions above are easily understandable by referring to the definition of accident. In the Concise Oxford Dictionary (1999) the word accident is defined as: "anything that happens without foresight or expectation; an unusual event, which proceeds from some unknown causes." The word unknown seems to refer to before an event happens. Similarly, the American Heritage Dictionary (1994) defines accident as "an unexpected, undesirable event; an unforeseen incident; lack of intention; chance; a circumstance or an attribute that is not essential to the nature of something". Accident has also been defined as "unplanned and uncontrolled event that has led to, or could have caused injury to persons, damage to plant or other loss".

Hoyos and Zimolong (1988) proposed definition of accident as follows: "an unsafe event that could result in injury, damage, or loss", while Rowlinson (1997) defined accident while taking into account its causation, as follows: "unplanned incident leading to death, injury or property damage, which stems from inadequate management control of work processes manifesting itself in personal or job factors, which lead to substandard actions or conditions, which are seen as the immediate causes of the accident."

Studies of accident causation show that any unsafe act and or unsafe condition as a risk of accident are generated by lack of management control. Managerial and organisational factors have become a central issue in many studies on construction safety because of strong convincing assumption that the root cause of accident lies in a hand of management systems (Rowlinson, 1997). Churcher & Alwani (1996) divided the causes of construction accidents into three classes namely: those due to design decisions (36%), those due to lack of planning

(36%) and those due to failure during construction process (27%). These figures were obtained from European Communities. This means 63 % of fatalities and injuries on site are traceable back to design decisions or lack of planning. It can be argued that many of these situations are avoidable if due thought is given at the early stage of the projects i.e. how the nature of the design will influence the construction process and the health and safety of workers on site. All players in the industry have vital roles to ensure better health and safety, which in turn will result in better quality and productivity.

Since the introduction of the domino theory of accident causation (Heinrich, 1969), accidents have not been only viewed as a consequence of operative unsafe actions and unsafe site conditions but further as a consequence of lack of management control. Research in the last decade showed that management and organisational failures are often precursors of accidents (Reason, 1993; Groeneweg, 1994). It has been found that around 70% of accidents could be prevented by improved management (HSE, 1993). Duff (1998) specifically asserted that construction safety problems are, and always have been, one of management control. In fact, the term 'management control' here is generally understood to be part of contractors' management, related to the construction process. Construction site safety is widely perceived as a matter of construction management rather than clients' management or other participants' management. Therefore, when a construction accident takes place, perceived factors of construction accidents causation are always associated with contractor's management failures or site operative failures to control unsafe site conditions or unsafe actions (Abdelhamid and Everett, 2000). This may result from lack of understanding as to how these project participants can share their attempts in controlling construction safety. All these studies

strengthened the famous Domino Sequence Theory by Bird (1993). In this theory, the flow of causation of accidents starts from the upstream activities due to lack of control by management and ultimately resulting in injury, loss or damage to people and property respectively.

Reason (1990, 1991) had argued that organisational and managerial failures are latent failures and specifically created by fallible decision. Finally, to deal with accident causation one should answer questions of why and how management leads to any unacceptable situation in conjunction with software, hardware and humanware employed by organisation to conduct production that will likely cause an accident. Generally, management function adopted in construction project is not different with others, however contextually construction project is very different. Duff (1998) specifically pointed out that the culture of the industry is a very male, 'macho' and authoritarian one. Accordingly, to answer those questions are not a simple task. There are many factors interacting in uncertain way throughout the running of a project life cycle starting from the conception, design, construction, operation and demolition. In these phases, many parties involve and interact with different perception and approach to achieve objective of a project (Walker, 1996). Construction is a stage where a number of people involved and intensity of their interaction achieve a peak condition. The decision by management in project conception and design stages will be implemented by using many resources in full-scale real production. A fallible decision and an unanticipated risk and constraints on the conception and design stages will arise and bring many consequences. Accordingly, management of construction firms and their site management will face pressures

and constraints from external systems such as competitors, clients, designers, government, and local authorities (Fryer, 1997).

Despite that, each participant has also own constraints stemming from their nature of organisation. Again, when management is viewed as a source generating any unsafe acts and unsafe conditions leading to accident, hence there are multiple down effect starting from client's management, designer's management, contractor's management and finally on site management. Because of that, any accident take place on site, causalities may be tracked back throughout investigating managerial and organisational problems stemmed from on site management up stream to client's management. Therefore, risk of accident may not just be resulted from on site factors but also by factor in remote, it might be a client's obsession transmitted through design and specification by designer and construction implementation by contractor as well as operation by operative.

The causal process of the accident itself can be viewed from several different perspectives. For example, psychologists will look at behaviour of those involved in an accident event, ergonomists will look at an interaction between men and machines, and system engineers will look at malfunction of working process system. There could be, therefore, many different approaches to modelling accident causation. Reason (1993) explicitly divided the approaches as individual accident causation and organisational & management accident causation. The former addresses accident causation as a result of individual actions in which operatives are the main concern (Hinze, 1996a), the latter incorporates management actions in which people at management level could be involved in the causal process. Blockley (1996a) suggested the

application of a socio-technical approach using integration of technical, engineering, human, and social science as well as management science.

It is presumed that an accident is caused by preconditioning factors known as latent failures and triggering factors or active failures (Reason, 1990b), which are interrelated in a random fashion. The socio-technical approach can be described as a systemic approach in which accident causation is viewed as a result of various deficient factors in a system state of work activity. Bellamy and Geyer (1992) used the socio-technical approach to analyse a process of accident causation by structuring 'pyramid causation' in which engineering and human reliability, communication, organisation and management as well as system climate are considered as possible factors leading to accidents.

Modelling industrial accidents usually refer to occupational accidents. The term "industrial accident" has been used to distinguish them from accidents in other fields, such as transport or traffic. The industrial accident is about accident events occurring in industrial work, particularly manufacturing or process plant industry. An industrial accident may involve workplace transport accident, but this accident is categorised as an industrial accident.

The causal processes of the accidents are varied depending on the type of industry. The nature of hazards or risks involved in industrial work will influence the types of accidents and causal factors. For example, in the industrial accident most types of accident are disturbances of the interaction between operatives and machines. Therefore human errors and machine malfunctions are among major concerns in industrial accidents. Naturally, a different type of

industry will have different types of accident event. For instance, in construction industry, falling from height is the most frequent type of accident, compared with machinery accidents in manufacturing or process plant industry (HSE, 1997).

Previous attempts to model industrial accident causation have been formally concerned with operative actions as a stimulant leading to accidents (Hale and Hale, 1972). The older theories of accident, such as psychoanalytic theory, stress theory, and arousal theory address the concept of how and why operatives have an accident (Brown, 1990). In those theories, therefore, individual behaviours, particularly human errors, become a major subject in accident causation. Although other theories, for instance epidemiological theory, ergonomic theory and situational theory have introduced working environment and working technologies as contributory factors to stimulate accidents, operatives are still as the major concern (Hale and Hale, 1972).

Changing of the old theories as pioneered by Heinrich (1959) introduces underlying factors leading to the individual behaviour. The domino theory of accident developed by Heinrich in 1920 has taken into account environmental and social features as a part of causal structure in accident causation. Modifications of this theory (Bird, 1974; Adam, 1976) have suggested that lack of management control of industrial works becomes a root cause of an accident. Those modified domino theories have changed the approaches of modelling accident causation in which accident causation has been viewed more than just a matter of individual behaviour. Since the introduction of these approaches, the paradigm of accident causation has changed from individual accident to organisational accident. This change implies an

understanding that unsafe behaviours and unsafe states are only symptoms rather than root cause of an accident event. Further development of accident modelling is then concerned with generating mechanisms of underlying causes by looking at organisational and management failures (Suraji et al, 2001).

Turner (1978), Blockley (1980), Pidgeon (1988), Reason (1990c) and Groeneweg (1994) are pioneers of research into organisational accident causation, by incorporating latent failures generated by management actions into a causal process of accidents. Introduction of this organisational accident attempts to reveal unsafe organisational rather than individual behaviour. Reason's tripod model has addressed the existence of resident pathogens in the organisation. The resident pathogens are latent failures associated with organisational and management functionality, which stimulate triggering factors described as active failures that may lead to accident causation. Further development of the tripod theory by Groeneweg (1994) contains details of latent failures classified as general failure types (GFTs).

The construction accident is a part of the industrial accident classification. Development concepts of construction accident causation have usually adopted industrial accident models. However, since early 90's research into construction safety has been focusing on development of accident models for the construction industry (Bellamy and Geyer, 1992; Whittington et al, 1992; Suraji et al, 2000). As with development of organisational accident causation models (Reason, 1993; Groeneweg, 1994), the concept of latent failures or underlying causation is also considered.

Whittington et al (1992) modelled the accident causation process as a sequence of failure initiation. The failure can be generated by individual, site management, and project management. Hinze (1996a) introduced a model of individual failure mechanism in which distraction to operatives is considered as a combination of mental diversions and physical hazards. Atkinson (1998) classifies contributory factor of construction accident as individual, managerial, and global factors. It was found that organisational factors are among significant factors affecting safety performance on construction sites (Sawacha et al, 1999). Abdelhamid and Everett (2000) introduced a conceptual framework of causal process of construction accident. These concepts, however, still consider that management or organisational failures are ascribed to those organisations that undertake the construction process on site. Those involved in conceptual and design developments of a construction project are still ignored as stimulants of construction accidents. Therefore, it is still unclear how the causal process connects those upstream failures to construction accident causation. It is necessary to develop a concept revealing how all project participants involved in a construction project can increase the risks of construction accidents through actions throughout the project development process. Although the CDM (Construction, Design and Management) Regulations 1994 recognise the potential contribution of people and roles distant from the site, none of these previous modelling approaches have taken them into account.

3.5 Challenges for Improving Safety in Construction

For many years, various attempts have been made to respond construction safety problems, such as imposing safety regulations, safety training, safety audits, safety campaigns and safety studies. For instance, introduction of the Construction, Design & Management (CDM)

Regulations in the UK construction industry in 1994 is an attempt to involve designers, or even clients, in managing the risk of construction accidents. However, the effectiveness of these regulations is still criticised by construction practitioners (New Civil Engineer, 2000 a, b). Safety training seems only for those who work on front line of production processes rather than those who are in an upstream part of project organisation level. The safety audit is usually designed only to find out risks or hazards at the technical or operational level, but less concern at managerial level of project organisation as a whole. Safety campaigns are only made for operatives rather than for those who are involved during the concept or design phase of a construction project.

There are some reservations in the success of legislative approach in tackling the health and safety issue, whether through legislation, the desired 'cultural change' could be achieved. Lo (1996) compared the legislative approach with quality management approach in tackling site safety issues in the Hong Kong construction industry and came out with some interesting observations:

- Although there are a series of statutory laws currently applicable regarding health and safety with the latest Factories and Industrial Undertaking (F&IU) Amendment Ordinance 1994 with tougher penalties and the requirement of employing safety officer where there is 100 employees on site, the result is still not encouraging.
- The pace of developing safety culture is still very slow. Workers are still unaffected by safety campaigns.

- Safety campaign always ends up as just a slogan and the way of achieving safety remains blur and remote to many employers and employees.
- Small contracting firms do not have sufficient resources to implement safety management.
- The effect of training is minimal in the local sub-contracting system.
- There are lack of trained and experienced 'safety professionals' in safety management.

Lo (1996) cited that past statistics, which show consistently high accident rate, indicates that legislation approach in enhancing safety culture is not encouraging. The conventional legislation approach has the advantage of being straight forward in implementation. It simply penalises the employer for breach of the legislation, however, it does not prevent the reoccurrence of illegal acts; it does not bring in long- term improvement and neither does it build a safety culture among employers and workers.

The lowest-cost syndrome in the bidding system, make safety as a minor consideration by all parties. The fines from successful convictions were low. Any fines imposed on the contractor will only mean lower quality of work since the contractor may not be able to divert the fine onto the sub-contractors; they invariably pay the fine for ignoring improvement works.

Prosecution is the very last means to enforce safety and can be costly to proceed. The low number of 1304 cases which lead to conviction for the past three years in Hong Kong shows that only accidents of serious injuries will be followed by prosecution. Safety becomes a

routine checking aimed at 'passing the buck'. Contractors are forced to comply with minimum statutory requirement which concentrated on the physical conditions on site. The effectiveness of risk control measures is not the factor of concern.

Lo (1996) then compared with the implementation of ISO 9000 quality management system adopted by the Hong Kong Housing Authority since 1990. In this system the client insists that contractors bidding for a project must have ISO 9000 accreditation. In this way, it is ensured that contractors with ISO 9000 have their safety management system embedded in their quality management policy. Safety management in terms of loss control can cut down accident losses and achieve optimum cost which is an essential element of modern quality management. Construction safety is a quality standard stated in the contracts and demanded by clients.

The obvious impact is that top management is committed to see that safety aspect is taken care of and this create positive culture between management and workers because they have the same objective of enhancing safety in the organisation.

The involvement of the government as a client to improve safety has been shown by the Government of Hong Kong, which implemented pro-active safety plan for the construction of Hong Kong airport and the end result was an encouraging the rate of only 0.8 per 1000 workers in term of fatal accidents.

The Architecture Services Department of Hong Kong has implemented a pilot scheme of safety audit incorporated within the procurement system that requires 2% of the project contract sum be allocated to safety. Contractors will receive the item payment in accordance to performance of the safety milestone check. The general approach of the scheme included:

- Submit a safety plan to the supervising department for approval,
- Establish a site safety management committee,
- Prepare and agree a safety and health check list,
- Assess the safety performance of the contractor in accordance with the checklist,
- Accomplice a total minimum score of 70% of the checked items.

From the study by Lo (1996), it is obvious that the main focus is still on the contractor and the downstream activities and neglecting other players namely: clients, and designers and early stages of construction. Safety culture should be for all parties and not only for contractors and sub-contractors. The involvement of government and the influential client has been shown as critical in the case of the Hong Kong airport project.

The introduction of CDM regulations in the UK has certainly an important effort in making all the parties responsible for health and safety in the procurement process right through the beginning of the project until demolition. This legislation has significant impact of the ways and actions by all parties regarding health and safety.

3.6 Improving Procurement for Safety

All activities in procurement process, right from the inception stage up to construction and even demolition, utilise the procurement as the 'tool' to get 'things done'. According to Lenard and Mohsini (1998), "Procurement is a strategy to satisfy client's development and/or operational needs with respect to the provision of constructed facilities for a discrete life cycle'. This sought to emphasise that procurement strategy must cover all of the processes in which the client has an interest, perhaps the whole lifespan of the building. Ireland (1985) defined procurement as "an overall management structure and specific management practices in use on a project." The term described the roles of the participants, the relationship among them, the timing of events, and the practices and techniques of management used. In an unpublished document by CIB W92, at its meeting in 1991, a working definition of procurement was developed, defining procurement as 'the framework within which construction is brought about, acquired or obtained (McDermott, 1999). Therefore all the activities from the very beginning of client's intention to build, until completion of the project and even the usage of the project and demolition, it is proposed that the procurement can be utilised as a tool to get things done.

In relation to health and safety here are some views showing the impact of procurement on health and safety. Loosemore et al. (1999) maintained that procurement issues are important in health and safety because of power balances between designers and contractors who are collectively responsible for health and safety performance. Fryer (1997) related the importance of change in attitudes of all parties for construction to become healthier and safer. In respect of procuring a job, the client must accept that there is a 'health and safety premium'

to pay in the cost of construction; that if getting rock-bottom price means that people will be killed or seriously injured, then the price is too low. According to Smallwood (1996) market conditions in South Africa are such that contractors frequently find themselves in the iniquitous position that should they make the requisite allowances for health and safety, they run the risk of losing a tender or negotiations to a less committed competitor. These are some examples of the utilisation of procurement in enhancing health and safety and the study done is to look into this aspect in order to highlight some of the important 'areas' in the procurement route that can be further improved so as to have more impact on the health and safety of the project.

3.7 Construction Health and Safety in Malaysia

Currently there are three laws governing the safety and health of workers in the construction industry. These laws are The Factories and Machinery Act 1967(FMC), The Occupational Safety &Health Act 1994(OSHA), and The Construction Industry Development Board Act 1994. The first two laws are enforced by the Department of Occupational Safety and Health (DOSH) while the last law is enforced by the Construction Industry Development Board (CIDB). Briefly description below is the Acts available and the authorities responsible for the implementation of the acts.

The Factories and Machinery act was established in 1967. This Act was enacted on February 1, 1970. In this act, a building site is considered as a factory as it is a premise, place or space where building operations or work of engineering construction are carried out. A building operation is defined to mean the construction, structural alteration, repair or maintenance of a

building (including repainting, redecoration and external cleaning of the structure) and demolition of a building and the preparation for the laying of the foundation of an intended building (The Factories and Machinery Act 1967). A building construction site therefore has to comply with the provision of the Act. The Regulations in the Act which are relevant to the construction site are as follows:

- The Factories and Machinery (Building Operations and Works of Engineering Construction) Regulations 1986,
- The Factories and Machinery (Safety, Health and Welfare) Regulations 1970,
- The Factories and Machinery (Electric Passenger and Goods Lift) Regulations 1970,
- The Factories and Machinery (Noise Exposure) Regulations 1989, and
- The Factories and Machinery (Mineral Dust) Regulations 1989.

The Factories and Machinery (Building Operations and Works of Engineering Construction) Regulations is a technical set of regulations stipulating requirements which need to be implemented at a construction site as well as specific requirements related to scaffolds, demolition, material handling and storage, use and disposal, piling, blasting and use of explosives, and power tools. The regulations also require the main contractor as well as the sub-contractor to appoint part-time safety supervisors to ensure compliance with the provisions of the Regulations and to promote safe work practices among their workers at sites. The main contractor is also required to form a safety committee consisting of safety supervisors, senior personal of the main contractor and other site workers who are appointed

as members. The Regulations however do not include the requirement to ensure the establishment of a comprehensive occupational safety and health management system at site.

The Occupational Safety and Health Act 1994 is an act which directly focuses on health and safety. The act is a non-technical law which stipulates the general duties of employees as well as designers, manufacturers and suppliers. It aims at providing further protection to the safety, health and welfare of persons at work and of others who may be affected by hazards originating from the activities of persons. The basic thrust of the law is on self-regulation wherein the Act spells out the outcome that the employers need to achieve but does not specify the means of achieving it. It is up to the employers to formulate ways and means of achieving the end. This suggests that employers must come up with their own customised safety and health plan and policy for their workers while the government provides the general guidelines. This is therefore a legal tool which can be used by the authority to ensure that construction sites establish a comprehensive system for managing safety and health.

The Construction Industry Development Board Act 1994 was then also introduced for the industry. This is a law which has been enacted to establish the body corporate called the Construction Industry Development Board for the purpose of looking after all matters relating to and implementing government policy in connection with the development of the construction industry. This Act (Act 520) was gazetted on July 1994. The Act is enforced by the CIDB, which is a body corporate whose missions are among others to ensure quality and adherence to high safety standards in the construction industry and that the industry contributes positively to the national economy. Among its function are as follows:

- promote and stimulate the development, improvement and expansion of the construction industry;
- promote quality assurance in the construction industry;
- accredit and register contractors and cancel, suspend or reinstate the registration of any registered contractor; and
- accredit and certify skilled construction workers and construction site supervisors

The enactment of the Act and the establishment of CIDB is a blessing for the construction industry especially with respect to safety and health of workers. The process of registration of contractors will hopefully ensure their responsibility, commitment and accountability in all respect including safety and health of workers. Certification of skilled-workers will ensure quality and to inculcate safety culture among the workforces.

Department of Occupational Safety and Health (DOSH) is an agency that promotes safety and health. DOSH has been entrusted with certain responsibilities as stated in its mission statement, which is to enhance the quality of working life through the promotion of a safe and healthy work culture. DOSH has three core functions namely standard setting, enforcement and promotion. First, this means that DOSH has to be continually active in generating the relevant legislation, codes of practice, guidelines, documents, brochures etc. and to guide employers and workers onwards along the path to acceptable standards of OSH in every workplace. Secondly, DOSH has to conduct strategic and effective enforcement to ensure that all national OSH standards carrying legal weight, such as Acts and Regulations, are complied with. OSH 1994 is centred around "the primary responsibility for doing something about the

present levels of occupational accidents and diseases lies with those who create the risk (the employers) and those who work with them (the workers)." The objectives of DOSH are as follows:

- To formulate and review policies, legislation, codes of practice and guidelines pertaining to occupational safety, health and welfare as a basis in ensuring safety and health at work;
- To ensure through enforcement and promotional works that employers, self-employed persons, designers, manufacturers, suppliers, importers and employees always practice safe and healthy work culture, and always comply with existing legislation, codes of practice and guidelines; and
- To assist and provide expert services in promotional, training, information dissemination and research activities organised by government and non-governmental agencies, institutions of higher learning, associations of employers, workers and professionals in efforts to further upgrade the standard of occupational safety, health and welfare.

National Council on Occupational Safety and Health (NIOSH) is an advisory council for health and safety. This council was formed in 1985 and the primary function was to advise the Ministry of Human Recourses on matters concerning to safety and health of the workers. This council was disbanded immediately after the enactment of the 1994 Act. In replacement, a National Council for Occupational Safety and Health was established. The objective is still the same and the only difference is that the National Council is given certain legal powers and functions in order to achieve the objectives of the Act. This council has functions, such as to

carry out all matters for or related to the implementation of the objectives of the OSH Act 1994, and The Council may, and when requested by the Minister to do so shall, carry out investigations and make report and recommendations to him regarding any matters related to the objectives of the Act especially:

- Necessary amendments to legislations related to OSH;
- Improvements in the administration and enforcement of legislations related to OSH;
- Encouragement of the cooperation and consultation between the managements and the employees with regards to safety, health and welfare of people at work;
- The special problems of safety, health and welfare of women, handicap people and other groups in the society;
- The formation of satisfactory control concepts at work places related to the chemical industries;
- The presence of health caring facilities in the work places;
- The analysis of accident and death statistics related to work;
- Encouraging the development and acceptance through the legislations, industrial working procedures related to occupational safety, health and welfare; and
- The development of planning and recovery facilities to assist people who have been injured at their work places.

The council has some activities, for instance:

- National Council meetings,
- Safety campaigns –every 2 years,
- Visits by council members to workplaces in the country,
- Visits by council members to foreign countries to attend seminars, conferences,
- Distribution of posters, stickers,
- Seminar for CEO and senior officers (jointly with DOSH, NIOSH and SOCSO),
- Secretariat activities with DOSH and other agencies.

NIOSH was also set up to provide training, research and development which was under DOSH and this gives DOSH more opportunity to concentrate on enforcement. NIOSH is funded by the government but runs as a private limited company. NIOSH is expected to fully fulfil its role as the premier training and research institution on occupational safety and health in the country. These are the legislations and laws as well as agencies concerning safety for the construction industry in Malaysia and the relevant authorities. The establishment of the Malaysian Construction Industry Development Board (CIBD) was an important step in improving the industry. The establishment of CIDB was the result of the concern of the government relating to the quality and safety record of the industry. Realizing the need to make the industry more competitive and to provide effective leadership and coordination among the players in the construction industry, a working committee called Working Committee on Construction Sector was formed in 1991. This committee was responsible to coordinate dialogue with various bodies, government agencies, academics and all players in the industry and the result was the Bill for the formation of the Board was approved by

Parliament in May 1994 and was gazetted as an Act, viz Act 520 Lembaga Pembangunan Industri Pembinaan (CIDB) Malaysia Act in July 1994. The Board began its operation on 1st December 1994.

In relation to health and safety, the CIDB has taken some important and significant steps, such as the introduction of The Green Card Program. The purpose of this program is to ensure all personal entering a construction site have undergone basic health and safety course and are registered with CIDB. The objective of this program is to enhance the level of understanding about health and safety to all workers on sites in order to make them more safety conscious. There are three elements in this program:

- All construction personnel who enter the site must undergo the 'One Day Safety and Health Course for Construction Workers.' The Department of Safety and Health (DOSH) which is under the Ministry of Human Resource, has defined workers as all construction personnel from the management to the general workers. The construction personnel will have to be registered with CIDB and a Green Card will be issued;
- All personnel entering the site must wear appropriate protective equipment; and
- The contractor must implement a safety and health management system.

Although there are serious efforts by the government to improve safety record, the situation is far from satisfactory. A survey done by the Malaysian Human Resources in 1997 (Narayanan & Wah,1997) founded that out of 326 construction sites in Selangor (one of the states) and also Kuala Lumpur showed that only 17 of them (or 5%) had instituted satisfactory safety

and occupational health precautions. They also stated that according to the Ministry's Workers Safety and Health Department, falls from tall buildings topped the list of fatal accidents on sites. This is an important indicator about the degree of implementation in respect of the safety regulations in Malaysia. Despite the rapid rate of increase in industrial accidents, few employers have taken steps to protect their workers against accidents. The report by (Lee and Sivananthiran, 1995), which surveyed 14 principal employers in the construction sector, indicated that not enough was being done to prevent accidents. For instance, only 5 out of 14 principal employers had taken basic steps such as providing safety and industrial boots, safety helmets and safety gloves, to protect their workers.

3.8 Factors Affecting Construction Health and Safety

Since the development of the domino theory of accident causation (Heinrich, 1969), accidents have not been only viewed as a consequence of operative unsafe actions and unsafe site conditions but further as a consequence of lack of management control. Research in the last decade showed that management and organisational failures are often precursors of accidents (Reason, 1993; Groeneweg, 1994). It was found that around 70% of accidents could be prevented by improved management (HSE, 1988). Duff (1998) specifically asserted that construction safety problems are, and always have been, one of management control. It is now generally understood in Europe, enshrined in European legislation and, more specifically, since the introduction in 1994 of the Construction [Design and Management] (CDM) Regulations in1994 into the UK legislation, that design of the constructed facility should take into account foreseeable risks during the construction process (Duff & Suraji, 2000). Clients

and designers could no longer distance themselves from what is happening on site and it is about time they were required to take in the issue of health and safety more seriously

In this research the word 'procurement' means the overall process of getting the work done. This means the study will include the type or methods of procuring work e.g. traditional, design-built, management contracting and also methods of engaging consultants for the project. All the process of procuring the project will be scrutinised to reflex the focus on health and safety in the design stages. Rwelamila and Smallwood (1999) concluded from their study that incorrect choice and use of procurement systems has contributed to neglecting of health and safety aspects by project stakeholders. Loosemore et al. (1999) maintain procurement issues are important in health and safety because of power balances between designers and contractors who collectively responsible for health and safety performance. Dreger (1996) concurs and says the form of construction delivery affects contractual relationships and the development of mutual goals. Fryer (1997) related the importance of change in attitudes of all parties for construction to become healthier and safer. In respect of procuring a job, the client must accept that there is a 'health and safety premium' to pay in the cost of construction; that if getting rock-bottom price means that people will be killed or seriously injured, then the price is too low. According to Smallwood (1996) market conditions in South Africa are such that contractors frequently find themselves in the iniquitous position that should they make the requisite allowances for health and safety, they run the risk of losing a tender or negotiations to a less committed competitor.

Meere (1990) advocated the integration of design and construction as a contribution to improving health and safety. Dregger (1996) recommended the design-built contract form, as context of sustainability, health and safety included; it establishes one entity to provide both design and construction which has the greatest potential for success as it creates common project goals. In the UK government's initiative to be the best practice client when procuring projects, the following principles are recommended (Construction Procurement Guidance, No.10, OGC, 2001):

- Demonstrate a high level of commitment to health and safety through ambiguous policies, senior management action and compliance with statutory health and safety requirements;
- Carry out rigorous assessments of candidates to establish their competency and the adequacy of their resources as well as commitment to continuous improvement in health and safety during the selection process;
- Know the current safety performance and continue to set increasingly demanding but realistic targets against which they can measure their ongoing performance and that of their suppliers;
- Create, at an early stage, an integrated supply team and especially ensure that the design and construction aspects are properly considered before construction work starts;
- Provide sufficient time to carry projects safely;
- Ensure that there are sufficient resources;
- Ensure that there is good communication between key parties; and

- Create an environment where everyone, including workers, can put forward suggestions for improving health and safety.

Construction companies have direct power and capabilities to influence safety and health conditions on sites, but the actual task is carried out by the employees, with design and performance requirements from the client, inputs from the sub-contractors and sometimes in coordination with other contractors (Dias, L.M.A.D & Curado, M.T 1996). Partnering between the several stakeholders may allow the creation of a safety culture reaching beyond contractual arrangements and legal regulations and obtaining results at the behaviour level. According to Levitt and Samelson (1993), "*Partnering brings together the various contracting groups involved in the construction project- the owner, the general contractor, the subcontractors, the architects and the engineers, the suppliers-to develop mutually acceptable goals for running a construction job.*" The key elements for partnering being: Commitment, mutual goals, trust, strategies and mechanisms for solving problems, periodic joint evaluation of goals and timely responsiveness by all stakeholders (Levitt and Samelson 1993). According to Levitte and Samelson (1993) there are two reasons for expecting that partnering will decrease the incidence of accidents in the construction industry.

- Improvement in relation between the user, the contractor, and the subcontractor should reduce pressures and tensions on the job; and
- The performance objectives which form part of the partnering charter usually include a specific mention of job safety and zero injuries could well be the agreed-upon goal.

3.9 Committed Client as Procurer

During the project conception process, clients and the client's project team have to address safety matters. They should commit to control foreseeable factors that undermine safety of construction process. The client and their project team must be aware of their actions which may affect designers, constructors and operatives during the project design and construction process. Any action taken by the client or the client's project team during the project implementation process must be reviewed to whether it will introduce any precursors undermining further processes.

Clients have great influence on the overall success of a project. Clients have the moral duty if not the legal duty to take reasonable care to ensure safety to all workers on construction sites. They have to make sure that the contractors recognise their contractual responsibility to work in a healthy and safe manner. Due to the optimal interaction with designers or consultants, clients have great influence to encourage designers to recognise the importance of health and safety aspects of any particular project (Jeffery and Douglas 1994).Clients should realise that successful projects are those projects not only completed on time within budget and in accordance to specification but also being done with due consideration for health and safety of the workers. Clients are responsible to provide a detailed comprehensive brief for the design team. This is the most crucial phase to ensure minimum variations of design during construction phase where variations from the brief can be the catalyst that triggers a series of events from designer through to workers that culminate in a site accident (Smallwood 2000). The client's pressure to complete a project due to commercial demands can be counterproductive and negatively effects health and safety because this will result in undue

stress to workers in order to complete the job under pressure (O'Reilly et al 1994). In a survey done in South Africa by Smallwood (1998), he concludes that most clients give priority equally to cost and quality and only a minority gave priority to health and safety.

The support from construction clients for the Rethinking Construction initiative, both public and private sectors can be seen in the creation of the Clients Charter. This charter which is run by the Confederation of Construction Clients (CCC) is an effort by the clients of the UK construction industry to achieve continuous improvement across their procurement activities. They establish an improvement strategy by using measurement of their performance as a basis for other members to measure against. The Charter provides for clients to generate their performance data, pooling this information so that they can benchmark their own performance with other client groups. (Construction Client's Charter, Charter Framework: www.clientsuccess.org)

In the UK public sector represents about 40% of the construction orders (Accelerating Change-A report by the Strategic Forum for Consrruction-2001). The scale of investment by the government in construction makes it an influential client. The public sector therefore, can make a substantial difference to the widespread adoption of the Rethinking Construction principles, client leadership, integrated team throughout delivery chain and respect for people. It has vested interest in getting best value from construction if it is to demonstrate that it is the best practice client, which consistently secures the best whole life performance that the construction industry can offer. In a report called Accelerating Change (HSE, 2001) the public sector can help to achieve this by:

- A financial and audit regime which supports best practice, further encouraging movement away from short-termism that places lowest initial cost ahead of whole life performance,
- Removing the divide between capital and revenue expenditure in local government projects to help realising value for money as opposed to lowest price,
- Linking government funding of construction projects to the application of Rethinking Construction principles,
- Audit processes attached to such expenditure to evaluate the extent to which value and whole life performance, are used as the basis of procurement,
- Providing a lead in the procurement of sustainable construction.

The role of clients in the construction industry in promoting health and safety is crucial because if they demand for high health and safety standards on their projects, all other team members will be obliged to follow. Such clients see best value (rather than lowest cost) and health and safety as integral parts of their projects. These clients understand the real meaning of successful projects, i.e. projects that are completed on time, within budget, acceptable quality and done safely. They understand that their reputation is at stake if not completed within those variables.

According to the Health and Safety Executive or HSE (HSE 2002), clients have a pivotal role in setting and achieving high standards in health and safety because they:

- set the tone for the projects;
- have overall control of how contracts are set up and how the work is done;

- make crucial decisions, e.g. budget and time for projects; and
- Select the designers, contractors, etc who carry out the work and decide the timing of their appointments determining whether they can work effectively as a team.

In Accelerating Change, a report by Strategic Forum for Construction chaired by Sir John Egan, the role of clients is further clarified. Clients should create an environment throughout all stages of the project, which delivers excellence in health and safety performance. They are good business and ethical reasons to do this. Even though some clients may wrongly seek to distance themselves from health and safety during the construction process they cannot take the same attitude to the safety of the finished product, which will be used by their employees or members of the public.

Increasingly the clients will be judged by their customers and financial analyst on their ethical stance in relation to health and safety in the same way as already happening for environmental performance and sustainability. Such issues have important impact on corporate image, and how local communities and stakeholders view them, in direct business terms, accidents on site may involve client liability and will lead to delays. Unhappy workers produce defective work. Poor health and safety performance of the building when in use will result in ineffective delivery of business objectives. Clients pay the price for all this avoidable waste.

The Accelerating Change makes some recommendations for clients in order to deliver excellence health and safety performance which are as follows:

- Setting the requirements for healthy, safe working;
- Making health and safety of their customers, staff, and everyone they work with, or for, a business priority at the forefront of their agenda when commissioning construction;
- Using integrated supply teams to ensure the effective contribution of the entire supply chain to delivering a safe site and a safe product; and regular measurement of the extent of integration throughout the supply chain; and
- Using the discipline of 'gateway' process to ensure they meet all their obligations to achieve a safe, efficient project. One that is more likely to be delivered on time and on budget. The gateways are critical predetermined points throughout the life of the project. Before gateway can be passed a review of all the project information and decisions to that date should be undertaken, preferably by a team of experienced people, independent of the project team. The project should not proceed to the next stage until satisfactory completion of the gateway review.

3.10 Role of Project Team for Construction Health and Safety

All players in the industry have vital roles to ensure better health and safety, which in turn will result in better quality and productivity. Their contributions have been highlighted by several authors as follows:

Designers

Designers hold a strategic position to design out risks of construction accidents. The following description elaborates designers' responsibility for designing a safe construction

process as described by Duff & Suraji (2000). The role is not only associated with providing better design outputs but also minimising negative effects of the design process and maximising the value of their design skills and project knowledge. Designers also need to incorporate safety matters into their design process in order to control construction risks associated with design products. It was found that designers have contributed technically to construction accidents in various ways (Maitra, 1999). For example:

- Temporary loading case, which occurred during erection, had not been considered by the designers;
- Possible temporary instability during installing a structure was not stated clearly in a method statement;
- Possible impact of designs on construction risks were not clearly added by highlighted notes in design drawings; and
- Possible requirement to shore structures during deeper trench excavations was not included in the technical specification, leading to a trench collapse.

There are several generic approaches available to designers that will impact on factors in the planning, control and operation of the construction processes. First, the design of the building itself can facilitate normal, foreseeable construction processes. The designers can consider in the design such factors as:

- Extra loads of the structures during construction;
- Facilities for handling built into elements of the structures;
- Facilities for location and fixing of temporary works, such as access;

- Comfortable access to inaccessible parts of the building during construction (and maintenance);and
- Influences of the building environment, such as ground conditions and building topography, on the construction process.

The International Labour Office (ILO) (1997) recommended that those involved in the design and planning of projects:

- Should not include anything in design and planning which would necessitate the use of dangerous structural or other procedures and, or hazardous materials which could be avoided by design modifications or by substitute materials; and
- Should consider the health and safety of workers during maintenance subsequent to project completion by; inter alia, designing so that such maintenance can be performed with the minimum risk.

Several authors have written about the importance of design in relation to health and safety. Jeffrey and Douglas (1994), "It has to be accepted that in terms of causation there is a link between design decisions and safe construction and maintenance. Especially maintenance access, late design, inadequate design and design changes during construction." This is based on research carried out by The European Foundation for Improvement of Living and Working conditions which concluded, that site fatalities (Smallwood, 2000):

- 35% were caused by falls, which could have been reduced through design decisions;
- 28% were due to the simultaneous performance of incompatible activities, and;

- 37% are were to the management of production

Second, information, collected for the purpose of design or during the design activity, and having potential impact on the safety (and efficiency) of the construction process, can be made available to the contractor through design documentation. Risk assessments are now required but, in many cases, without detailed knowledge of the construction process planned, designers will not be aware of the potential value of all the information held. Ways should be sought to structure, document and transfer this knowledge info a conveniently accessible form.

Third, designers can make their accumulated knowledge and understanding of the project available to the contractor through attendance at planning meetings. This will help to avoid contractors overlooking accident risks or simply being unaware of risk factors, through less familiarity with the features of the project. For these ideas to be feasible there are a number of changes that need to take place. Firstly, the mindset of many designers needs to change. Designers have to become aware that the output and organisation of the design process do not only affect the construction process in technical ways. Complicated design or high specification of materials may cause gaps with available construction technology, difficulty in obtaining materials required, unavailability of equipment or plant, or insufficient experience of builders. These deficiencies can contribute to construction accidents. For example: significant construction accident causes are found to include inexperienced workforce (4.2%), unsuitable construction materials (1.7%) (Suraji, Duff and Peckitt, 2001)

Secondly, the mindset of many contractors needs to be changed. The planning, control and operation of the construction process is, of course, the responsibility of the contractor; but the designer has considerably more knowledge of the project than is normally made available to the contractor, in the exercise of this responsibility. This knowledge should be sought and welcome.

Fourth, the designer needs help in defining the knowledge that could assist the contractor. Designers cannot be expected to anticipate the health and safety significance of all the information and understanding that they possess. A good beginning to achieving this would be more comprehensive data on accident causation, and particularly the underlying or distal causes that include the effects of design and the design process, so that designers could begin to understand the wide range of influences that they have over the management of the construction site.

Fifth, contractual and economic issues will have to be addressed. Acceptance of more responsibility and involvement of designers comes at a price. Although the huge social and economic costs of construction accidents, and not just injury related ones, seems to provide clear incentive to improve the management of construction, increased involvement of designers will be costly. The potential costs and benefits require detailed investigation.

Based on a research done in the USA concerning the impact of design on health and safety, Hinze and Gambatese (1994) discovered the following findings;

- In terms of the contribution of the various disciplines of design to health and safety, structural was identified the most frequently followed by architectural and then civil;
  - In terms of site hazard, falls were identified most frequently followed by obstructions and cave-ins, and
  - In terms of project components, structural-above grade was identified most frequently followed by architectural, and mechanical/electrical.

Hinze and Gambatese (1994) cited the following suggestions resulting from the research;

- Pre-fabricate building components in the prefabrication works or on the ground, and erect them as complete assemblies to reduce worker exposure to falls from elevation and being struck by falling object;
- Design columns to have a hole in the web at 42 inches (1070mm) above floor level to support a guard- rail cable and provide a connection point for safety ropes. Since the safety system is built in place such fabrication details will facilitate workers' safety with reduced construction cost and reduced worker exposure.

The design of a project will greatly influence the method of construction, which in turn determines the degree of safety and health intervention. Designer should have the knowledge or perception of the impact of their design on the way it is going to be built and the danger involved in the process. The designer has the opportunity at the design brief stage to interact with the client and together make sure that the design brief is clear and leave minimum scope

for any variations in the later stage. This is important because any variation orders (VOs) can be the catalyst that triggers a series of events from designer through to workers that culminate in an accident on site (Jeffrey and Douglas, 1994).

Quantity Surveyors

Verster (2004) asserted that "the cost engineering, quantity surveying and project management professions should also recognise developments in respect of new areas of knowledge, influence and the skills that would be required in the near future. He then quoted that knowledge areas that cost engineers or quantity surveyors should concern as Zack (2004) clearly showed the effective role that the cost engineer (quantity surveyor) could play in respect of the new areas of safety, environment, finance and claims. In term of health and safety, all over the world health and safety have become very important issues needing effective management to ensure more acceptable working conditions for people. The cost engineer and quantity surveyor should play a role in respect of budgeting for health and safety as well as controlling cost in respect of risks, insurances, premiums and alternative selection. Quantity surveyor's role in advising the client in choosing the right procurement strategy is crucial and according to Rwelamila and Smallwood (1999) incorrect choice of procurement systems has contributed to neglecting health and safety by project shareholders. In "open tender" system where normally it is very competitive, contractors frequently find themselves in the iniquitous position that should they make the requisite allowances for health and safety, the risk of losing a tender will be higher (Smallwood 1996a). Even Loosemore et.al (1999) asserted that procurement is an important factor to provide balance of power between designers and contractors who are collectively responsible for health and safety performance.

The early integration between designers and contractors at design stage provides an opportunity for all parties to consider the issue of health and safety in design. Meere (1990) advocated that integration of design and construction has a positive impact on overall health and safety. Dreger (1996) recommended the design-build contract form, as within the context of sustainability, health and safety included, it establishes one entity to provide both design and construction which has the greatest potential for success as it creates common project goals.

Pre-qualification of contractors can be a mean of assessing and choosing contractors with good safety record (Smallwood, 1998). Health and safety should be one of important criteria in the pre-qualification process so that only contractors with good health and safety record are considered. Levitte and Samelson (1993) recommended the following information should be requested from contractors for evaluation at pre-qualification stage:

- written health and safety policy
- written health and safety rules
- written programme either standard or customised
- project plan which indicates specific actions due to the nature of the projects
- Organogram indicating responsibilities of key personnel
- line management accountability and how it is measured and
- references from other clients

Constructors

Construction companies have direct power and capabilities to influence safety and health conditions on sites, but the actual task is carried out by the employees, with design and

performance requirements from the client, inputs from the sub-contractors and sometimes in coordination with other contractors (Dias, L.M.A.D & Curado, M.T 1996). Partnering between the several stakeholders may allow the creation of a safety culture reaching beyond contractual arrangements and legal regulations and obtaining results at the behaviour level.

According to Levitte and Samelson (1993) partnering brings together the various contracting groups involved in the construction project i.e. the owner, the general contractor, the subcontractors, the architect and the engineer, the suppliers to develop mutually acceptable goals for running a construction job. The key elements for partnering being: Commitment, mutual goals, trust, strategies and mechanisms for solving problems, periodic joint evaluation of goals and timely responsiveness by all stakeholders (Levitte and Samelson 1993). Levitte and Samelson (1993) showed that there are two reasons for expecting that partnering will decrease the incidence of accidents in the construction industry;

- "Improvement in relation between the user, the contractor, and the subcontractor should reduce pressures and tensions on the job".
- "The performance objectives which form part of the partnering charter usually include a specific mention of job safety. And zero injuries could well be the agreed-upon goal."

Contractors are the main contributors in establishing appropriate, i.e. safe, planning, control and operational management factors. However, they operate under a number of constraints, including the actions of designers as well as the action of clients or the client's project team (Suraji and Duff, 2000), and may fail to provide safe working conditions, at least in part, as a

result of these constraints. Current analysis of 1000 accident cases in the UK (Suraji, Duff & Peckitt, 2001) found that inappropriate construction planning (28.8%); inappropriate construction control (16.6%), and inappropriate construction operation (88%) are among frequent factors in construction accidents.

Different from clients, designers and constructors, operatives have more direct exposure to safety matters in real condition. However, since the practice of safety management is that all parties are responsible for safety, constructors and operatives may see the project construction process with less risk of incidents. In order to implement safety management, constructors need to develop the best practice model for detailing safety practice and then to integrate it with construction site management, risk assessment, planning, control and supervisory procedures. Constructors have to incorporate factors associated with construction planning, construction operation, and construction control into their strategic safety practices. Those factors have been derived by Suraji & Duff (2000) through extensive literature research. These factors can be described as follows:

- Construction Planning Factors (CPFs) are components of the planning and design of construction operations including technical design, and organisational and logistical planning of constructions works and design for temporary works.
- Construction Control Factors (CCFs) are components of the control of construction operations, such as control of plant or equipment operation, supervision of operatives work, and control of reliability or appropriateness of temporary works used in the construction operation.

- Construction Operation Factors (COFs) are technical or operational components of the process of constructing facilities or buildings. In order to ensure safe operations they must include, for example, appropriate construction methods, suitable equipment or plant, adequate working space, and comfortable working positions.

Success of any team or group in any situation is the ability to work together as a team. In the construction industry, this is more difficult to achieve due to the fragmented nature of the production process. The concept of 'partnering' is a fresh and positive concept trying to minimise the 'adversarial' or 'blame-culture', which the industry is suffering from. Rowlinson & Mathews (1999) cited the definition of partnering as advocated by the Construction Industry Institute of the USA in their report 'In Search of Partnering Excellence' which was formulated after studying 27 partnering case studies in the USA as:

> "...a long term commitment between two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisational boundaries. The relationship is based on trust, dedication to common goals, and an understanding of each other's individual expectations and values." Partnering can also mean emphasising the maximisation of effectiveness or shared resources, a shared culture and trust and common goals.

3.11 Summary and Conclusion

Understanding safety in construction is an important step to pursue improved safety for all parties involved. Better safety means better prevention strategy to either incident or accident

events. The advanced accident causation theories have shown a clear understanding of how to improve safety in construction. In principle, safety is not viewed as a matter of front line production which only involve operatives and site management downstream, but also the upstream part of organisation. It means that safety practice is not placed on constructor organisation and management only, but also designers, architects, engineers and even clients. It drives any parties involved in a construction project development to put any attempts to improve safety since the beginning of project conception, project design and project construction.

Clients can, throughout procurement process, put safety matters in place. They may influence all clients' project team, not only constructors and operatives on site, to eliminate, reduce, or avoid any precursors undermining safety in their duties. Designers, quantity surveyors, architects and engineers have to incorporate constructability with safety as important as cost and quality issues into their design criteria. In this case, any attempts to improve safety can be carried out by everyone at every stage of construction procurement process while promoting better safety practice in the construction industry.

The Malaysian construction industry has played an important role in developing the country. However, the industry image currently needs to improve. The challenges are, among others, shortage of labour, deteriorating quality of works, increase in the number of accidents on construction sites, material shortages and the fragmentation and segmentation of the construction industry. The industry clients and players still have less concern to health and safety as compared to the UK construction industry. The regulations and initiatives

concerning health and safety in construction still focuses on downstream processes of construction project delivery. Health and safety is still viewed as a matter of constructors' responsibility.

The DOSH and NIOSH have been established to promote health and safety practice, including training provision. In the case of construction safety and health, the CIDB has introduced a green card to enhance safety and health on site. However, they are still concerned with downstream level of health and safety aspects for operatives. In fact, many evidence from studies elsewhere shows that contributory factors of accidents on construction sites stemmed from the upstream part of the production lines. Those studies, therefore, suggest that health and safety should be addressed throughout project development process by all project participants involved. The introduction of CDM regulation has brought health and safety issues to the upstream of the production line while imposing designers and clients more responsibility of health and safety.

Controlling construction safety should be a matter for all project participants. Total safety control in construction means to make clients, the client's project team including quantity surveyors, designers, constructors as well as operatives to be aware of their role in improving safety performance in construction. In the TSC principle, precursors leading to increase the risks of construction accidents are controlled since in the beginning of the project inception, project design, and throughout project construction. It means that the design-construction integration should include inception as part of the integration where long term partnering and working well together among project participants is essential.

CHAPTER 4: RESEARCH FRAMEWORK

4.1 Introduction

As highlighted in previous chapters, many researchers reveal that building procurement is a potential scheme to deliver a public policy, such as affirmative action to increase competitiveness of the construction business of indigenous people. This research deals on how procurement process can be used as a tool to enhance safety practices in the construction industry. The procurement process and issues related to construction safety have been reviewed and presented in previous chapters. This has provided a bulk of theories underlying the work. This chapter is then to elaborate research framework within, which is a hypothesis or proposition is exposed for further tests. In this case, approaches to safety research is discussed in relation to the work and underlying concepts of how procurement can be a tool for enhancing safety is also discussed. Furthermore in this chapter, this research framework concerns with how client leadership and commitment as well as project team integration for the building procurement are regarded as variables enhancing safety practice in the construction industry. The discussion of approaches to safety research is to provide a framework on how to deal with those variables. This research framework will assist in developing propositions and the way those propositions will be tested.

4.2 Approaches to Safety Research

The construction industry is well known for its bad record concerning health and safety. This phenomenon is common both in developed and developing countries. The sector has always been considered as one of the important sectors in the economy of a country and therefore many governments have given special attention to the industry, which is regarded as a catalyst

to the overall economic development of a particular country. The bad health and safety record do not only tarnish the image of the industry, but it has direct impact on the quality and productivity of the industry. Both public and private sectors are struggling to improve the situation and it is the primary intention of this study to look into both sectors to find out the degree of success in their struggle. The 'uniqueness' of the industry is always cited as main reason and an 'excuse' to accept the low standard in term of health and safety as compared to other industries. But it can also be a focal point to start looking at other industries and valuable lessons can be learned to improve health and safety.

Both public and private sectors recognise the importance of health and safety to the construction industry. Rethinking Construction Document was launched to enhance the industry performance. It describes that "if the industry is to achieve its full potential, substantial changes in its culture and structure are also required to support improvement. The industry must provide decent and safe working conditions and improve management and supervisory skills at all levels." It concludes that the industry had to commit itself to change and its culture and approach to the health and safety and welfare of its employees was highly detrimental to its future economic success. The role of the clients as a leader in the procurement process is crucial to determine the success of team integration. Team integration is one of the most important ingredients to produce a quality product.

The Construction (Design and Management) Regulations 1994 (CDM regulations) introduces a new approach and commitment to managing construction projects and places new duties upon clients, designers and contractors. The Regulations enforce that health and safety is to be

taken into account and then managed effectively through all stages of the construction project: from inception, design and planning through the execution of work on site and subsequent maintenance and repair. With the introduction of CDM, there is some improvement relating to health and safety in the industry but the performance is inconsistent. Among the factors identified by the Health and Safety Executive (UK) are: the tendency for client to still prefer lowest cost tenders and also shortcoming of leadership, planning and management and often confrontational culture (Revitalising Health and Safety- Discussion Document- HSE Publication).

In order to have a systematic study of the cases, a protocol or guidelines are needed to ensure everything is identified. Therefore in these cases, the stages of the projects are divided into 5 stages, which is common for projects both in Malaysia and UK. At all stages, the commitment in term of actions or inactions of all parties is investigated to show the impact not only to the implementation of health and safety but on the role of client leadership, team integration and other relevant issues in the procurement process. The following are the stages:

1. Concept and feasibility: This stage begins when the client first thinks about having a structure built, repaired, refurbished, demolished or maintained. It overlaps with the start of detailed design work. During this period important decisions are made on layout and outline, overall scheme and initial design and construction methods, and also the choice of procurement method to be used.
2. Design and planning: During this stage detailed design works take place. Final decisions on matters related to design and specifications are made. Final production information (e.g. drawings) and specifications are produced. The preparation of

information for the tendering process also begins. For some form of procurement, there will be considerable overlap with actual construction starting (e.g. design – build).

3. Tender/selection stage: This stage primarily involves the selection of the principle contractor for the construction process. The final production of tender document (e.g. bills of quantities) and the procedures and processes for the selection of the principle contractor take place.
4. Construction phase: This stage covers the time for the principle contractor to plan, programme and prepare the construction work. Arrangements are made to start the work and then carry out and manage it.
5. Commission and handover: this stage includes the activities required to bring plant, equipment, building management and similar systems into operation and finally the structure is handed over to the client.

In this approach, the whole process activities, right from the inception to construction of a project were analysed to obtain the required data for the study. It is not possible to venture into the commission and handover stage because of time constraints. The process approach will give the opportunity to look into each activity at every stage in the procurement process while keeping in view the targeted objective i.e. in this case to achieve high standard of health and safety in the project. Health and safety achievements do not only represent by a favourable statistic at the end of a project, but also changes in safety culture, implementation of best practises at all stages of a project, which are more significant because of the involvement of all parties in the design stage of the procurement process. Through process

approach, activities at different stages of the process are the focus instead of looking into different professions and their activities. The focus on specific activity zones in the procurement process especially relating to the implementation of health and safety gives the opportunity to analyse critically the parties involved in that particular activity zone. In the individual activity zone, the parties involved, what are their functions relating to health and safety, how do they integrate with other team members, and other relevant issues will be scrutinised.

4.3 Models of the Safety Improvement

The literature reviews highlighted intended focus of this research, which is client leadership and team integration for construction projects development process. All this can be studied via the procurement process. A report funded by the HSE and the Institute of Civil Engineers (Construction health and safety in the new millennium-HSE 2000) has some important findings: 'The CDM regulations are thought to have had a positive role in helping to define the responsibilities of the different roles. However some organizational issues are still outstanding. The interaction in the supply chain is thought to often be divisive rather than supportive'.

The utilisation of public procurement has been discussed in previous chapters and it is also being used as an important tool to enhance health and safety in the construction industry. The UK government has introduced the Construction Procurement Guidance No 10 called Achieving Excellence through Health and Safety (OGC-2001) as a guideline to implement the value for money policy. Following the thorough literature review, a theoretical framework

was developed using the three drivers identified as (i) procurement, (ii) client leadership and (iii) team integration. The theoretical framework was essential to be used as a starting point for investigation, as guidance for the first steps in the field. Other variables may also be considered during the study. Therefore this type of research can be considered as inductive and aimed at theory building. Figure 4.1 below describes the drivers of improving health and safety through enhancement of health and safety culture and practices.

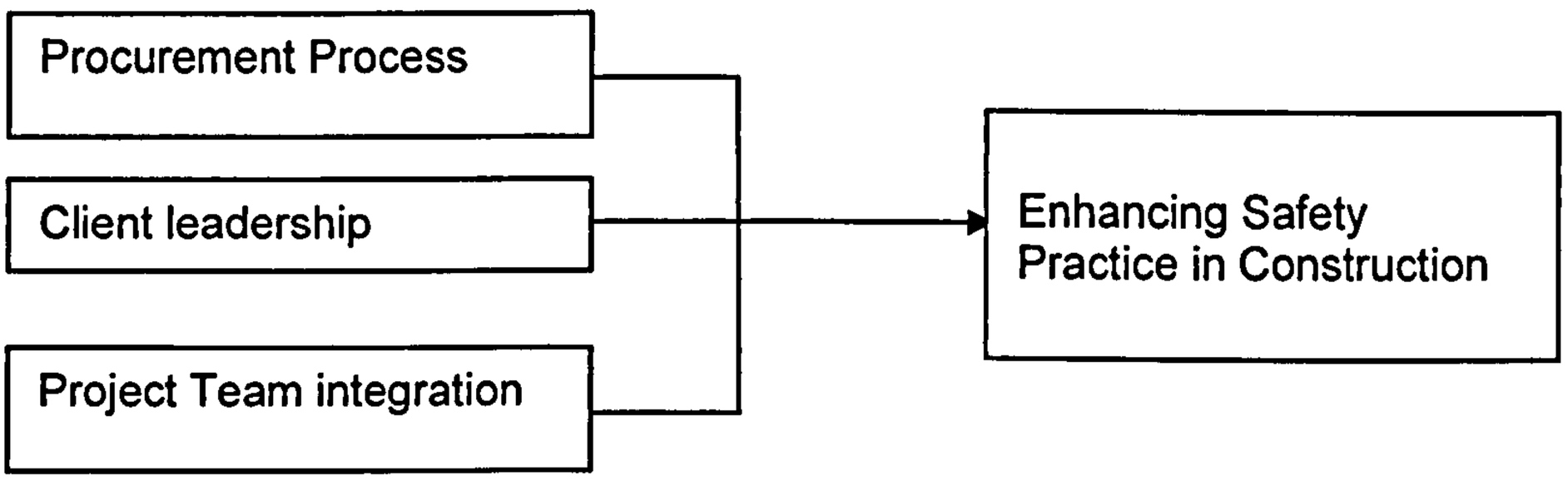

Figure 4.1 Models of Health & Safety Drivers in Construction

4.4 Improved Safety through Procurement

Diaz et al (1996) commented that the improvement of health and safety on construction sites means the enhancement of quality and productivity of construction labour on sites. This will also make the construction work more desirable and will attract more workers. With the shortage of skilled labour threatening many countries, the importance is obviously clear. In a survey conducted among the European Construction Institute (ECI), which comprised of clients, consultants and contractors, the following motivators have been identified as very significant for the development of better safety systems; changes in EC Safety Legislation and in UK, the CDM Regulations, total project management (TPM) concepts and pressure from

the client (Ayoade & Gibb, 1996). In the case of client pressure, it is interesting to note that this issue was raised by the consultants and contractors, and not by the clients themselves. In the survey, the clients rated their pressure as of little or no significance at all. In fact the consultants and contractors rated client pressure as the most significant motivator above legislation and TPM. This demonstrates the important role clients can play in improving the construction process, and the 'ignorance' of their role will have significant impact on the overall success of a project. Furthermore, Ayoade and Gibb (1996) highlighted the importance to integrate quality, TPM and safety systems. The pressures that force the integration are costs, legislation TPM and clients. Factors resisting integration are project-specific requirements, lack of understanding and commitment, perceived incompatibility of QS & E standards and legislation.

Diaz and Curado (1996) looked at partnering for potential influence to enhancing health and safety practices. Partnering between the several stakeholders may allow the creation of a safety culture reaching beyond contractual arrangements and legal regulations and obtaining results at the behaviour level. Construction companies have direct power and capabilities to influence safety and health conditions on sites, but the actual task is carried out by the employees, with design and performance requirements from the client, inputs from the sub-contractors and sometimes in coordination with other contractors. According to Levitte and Samelson (1993) there are two reasons for expecting that partnering will decrease the incidence of accidents in the construction industry;

1. Improvement in relation between users, contractor, and subcontractors should reduce pressures and tensions on the job; and

2. The performance objectives which form part of the partnering charter usually include a specific mention of job safety. And zero injuries could well be the agreed-upon goal.

In the UK the experimental research presented by Duff et al. (994) and Marsh et al. (1995) adopted a method of goal setting, performance measurement, the provision of feedback and training. These experiments provided results, although questioning the merits of training and emphasising the commitment of top management. This approach can be of difficult implementation in countries where there is a significant part of the construction work-force which is floating, not only between projects and companies but becoming and migrating to other sectors. They divided the causes of construction accidents into three classes: those due to design decisions, those due to lack of planning and those due to failure during construction process. The percentages in each category are shown below:

Design – 36 % Planning – 36 % Construction – 27 %

These figures were obtained from the European Communities. This means 63 % of fatalities and injuries on site are traceable back to design decisions or lack of planning. It is argued that many of these situations are avoidable if due thought is given at the early stage of the projects i.e. how the nature of the design will influence the construction process and the health and safety of workers on site. The European Union (EU) in its directive called 'The Temporary or Mobile Worksites Directive', June 1992, concluded that:

"...Whereas unsatisfactory and/or organisational options or poor planning of the works at the project preparation stage have played a role in more than half of the occupational accidents occurring on sites in the Community."

Smallwood (1996) described that occupational health and safety occurs or does not occur downstream of design and specifications, and also within the overall construction environment which is influenced by procurement systems. Through their design and details, designers affect construction methods and processes. Designers specify materials, which may be heavy, large in area, rough and sharp at edges or even toxic and potentially harmful to humans. Designers also influence procurement by advising on the project period and contract documentations. The need for designers to increase their contributions to health and safety is substantiated by both literature and descriptive surveys which determined, inter alia, that designers influence health and safety, contractors use designers output at bidding stage to budget for health and safety, mechanisms are required to ensure equitable allocation of resources to health and safety at bidding stage, and shortened project periods negatively affect health and safety.

Smallwood, (1996) cited the need of looking into the process approach in dealing with health and safety. Through the process approach all parties involved in the production process, the clients, designers, principal contractors, subcontractors and manufacturers will be able to be scrutinised to assess their involvement and role to enhance health and safety. Small wood (1996) concurred that it is importance to implement Total Quality Management (TQM) which optimises the synergy between health and safety, productivity and quality which results in

continuous improvement. Another process is partnering which will establish mutual project goals among all stakeholders, and complements TQM and prevents adversarial relationships. Levitt and Samelson (1993) explain that

"Total Quality Management (TQM) has as its main thrust continuous improvement in customer satisfaction, employee satisfaction, productivity and safety. The TQM mission in construction is to build quality product- i.e. an error- free one – for the use by preventing errors in the construction process by integrating quality, productivity and safety. A major emphasis is on doing work right the first time, thereby cutting the amount of rework required to create construction that meets the user's requirements."

Jeffrey & Douglas (1994) revealed that it has to be accepted that in term of causation that there is a link between design decisions and safe construction and maintenance. Especially maintenance access, late design, inadequate design and design changes during construction. This is based on research carried out by the European Foundation for the Improvement of Living and Working conditions which concluded, that of site fatalities:

- 35% were due to falls, which could have been reduced through design decision.
- 28% are due to the simultaneous performance of incompatible activities; and
- 37% are due to the management of production.

Smallwood (1996) stated that The International Labour Office (ILO) in 1992 placed the perspective role of designers by recommending those involved with the design and planning should not include anything in their design and planning which would necessitate the use of dangerous structural or other procedures and, or hazardous materials which could be avoided

by design modifications or by substitute materials. Due consideration should be given to the health and safety of workers during maintenance subsequent to project completion, by designing so that such maintenance can be performed with minimum risk.

Hinze & Gambatese, (1994) in their research relating design to safety, concluded that In terms of design discipline contribution to health and safety, structural was identified the most frequently followed by architecture and then civil. In terms of site hazard, falls were identified most frequent, followed by obstruction and caves in. In terms of project components, structural was identified most frequent followed by architecture and then mechanical and electrical. Jeffery and Douglas (1994) further stressed the importance of optimal interaction between the designers and engineers with the clients. It is mentioned that

> *"...Clients play a critical role in the construction safety related to site safety complimentary to the requirement of the client, completion on time, to cost and specification. Successful projects tend to be safe projects. The client must know exactly what he requires and he needs to develop a detailed comprehensive brief for the design team. This is probably the most crucial stage for the successful and safe completion of the project. The brief is a critical stage in ensuring site safety. Deviations from it at a later date can be a catalyst that triggers a series of events from designer through to operatives that culminate in a site accident."*

Research conducted in the USA by Hinze and Gambatese (1994) suggested that pre-fabricated building components in the factory or on the ground, and erect them as complete assemblies to reduce worker exposure to falls from elevation and being struck by falling objects. It is

described that design columns to have hole in the web at 42" above the floor level to support a guardrail cable and provide a connection point for safety cables. Since the system is built in place such fabrication details will facilitate worker safety with reduced construction cost and reduced worker exposure. Oluwoye and MacLennan (1994) asserted that pre-planning safety can be defined as the determination of the most appropriate construction method and construction programme that will protect workers from any danger or risk. The planning of safety is performed in line with the planning of building work for both design and construction. The design of the project is a great influence in determining the method of construction, safety plays an important role.

When referring to the standard form of contract used in the South African construction industry, Smallwood (1996), concurred that although references are made to health and safety, it is vague, hardly coercive and depending upon the level of commitment, contractors continue to address health and safety to varying degrees. The contractors are in a dilemma, whether to allocate more for health and safety and reduce the chance of winning a contract or to ignore the allocation for health and safety and have better a chance of winning.

Brandner (1993) stated the purpose of pre-qualification concerning health and safety is to provide a standardised method for selecting contractors on the basis of demonstrated safe work records, safety commitment, safety knowledge, and ability to work in a safe manner. The contractors being evaluated should at least provide safety policy, programme, client references, accountability and safety plan.

Smallwood (1995) concludes that project duration can influence the performance of health and safety because a shortened contract period invariably results in an increase in the number of workers, the number of hours worked per worker, or even a combination of the two. Due to shortened period, extra plants and equipments are likely to be introduced and this will add to higher risk for the workers on site. The additional numbers of sub-contractors will also be another factor for the higher risk. On a survey done on 252 general contractors in South Africa, Smallwood (1996) cited some important findings. Over 56% of the contractors agreed that health and safety was negatively affected by short project periods. The contractors identified 'general pressure', 'less time per activity' and 'more workers' as the main reasons for this phenomenon. Majority of the contractors i.e. 68 % stated that competitive tendering negatively affected health and safety. About 58 % responded that there should be 'health and safety pre-qualification' and a 'provisional sum' for health and safety. Design and method of fixing has been identified as the most common aspect/factors, which can negatively affect health and safety. Most contractors responded that architects and engineers/designers should receive health and safety education. Among some comments were that they should all have a general regard of how the contractor can build what they design. Health and safety problems/solutions rest with all of us. Smallwood (1996) made some recommendations for instance: occupational health and safety should be included in the curricula of architects, engineers and other designers at universities. Client should enquire of designers regarding their consideration for health and safety. Project documentation should include a mechanism to ensure equitable allocation of financial resources to health and safety. Contractors should be pre-qualified on health and safety criteria and information.

Levitte & Samelson (1993) identified management commitment as a pre-requisite for safety as management is responsible for establishing objectives; developing strategies to achieve the objectives; all resources and the allocation thereof. Management is also responsible for the development and implementation of systems; and by virtue of its role, sets an example and assigns accountability. Management creates and controls the environment in which incidents and accidents occur. Culture, which incorporates vision, values, mission, purpose and goals, influences the environment as it results in and reflects commitment to occupational health and safety. Commitment influences management system, which incorporates, practises, programme, accountability, priorities and improvement model.

Rowlinson & Mathews (1999) cited a successful scheme in Hong Kong through the procurement strategy by including a fixed sum in the bill of quantities to be priced for safety related elements such as personal protective equipment, temporary works, site meetings and safety committees. These items would then be paid for in the interim valuations when the project surveyor has checked these items off and certified them. Thus, the aim was to set a fixed sum aside in every payment for the provision of a minimum level of site safety infrastructure on each Hong Kong government or public project.

4.5 Integrating the Team into the Process

Jeffrey & Douglas (1994) stated that radical improvement in safety requires a cultural change, adoption of a safety culture by all sectors of the industry, (clients, designers, consultants, contractors) from inception through to execution. This requirement, together with the Temporary or Mobile Construction Sites Directive (TMCSD), was the fundamental reasoning

behind the Construction Design and Management (CDM) regulations 1994. The CDM will affects clients, architects, engineers, surveyors and other construction professionals as the contractor will no longer take sole responsibility for site health and safety. The regulations have extended safety responsibility from contractors to designers and clients. There is now a statutory link between clients and designers, site health and safety, fatalities and injuries.

Ayoade and Gibb (1996) highlighted the importance to integrate quality, TPM and safety systems. The pressures that force the integration are costs, legislation TPM and clients. Factors resisting integration are project-specific requirements, lack of understanding and commitment, perceived incompatibility of standards and legislation.

Construction companies have direct power and capabilities to influence safety and health conditions on sites, but the actual task is carried out by the employees, with design and performance requirements from clients, inputs from sub-contractors and sometimes in coordination with other contractors.

The rational concept of integrating the team is a synergetic integration of clients and the project team actions to promote a safe construction process. These actions mean any response by clients, the client's project team, designers and constructors as well as operatives to control, by elimination, reduction or avoidance, any precursors exist throughout project procurement process that lead to increasing risks of construction accidents. The concept of integrating the team is not only concerned with the integrated control process but integrated actions by all project participants to drive out undermining factors to construction safety. This

concept takes into account the constraint-response theory of construction accident (Suraji & Duff, 2000). In general, the theory addresses that any participant may introduce factors leading directly or indirectly to failures. This embraces the theory of human error that almost all factors leading to accidents arise, at least in part, from human action or inaction to eliminate, reduce or avoid accident risk. Furthermore, the theory addresses that:

1. Participants work within constraints arising from the situation of the participant's own organisation, another project participant or the project environment. For example, client's decisions at project conception can introduce resource or time constraints for all participants; or a contractor can, by changing the construction sequence, produce schedule constraints to the provision of production information.
2. A participant's response to such constraints will influence construction activity; for example, by providing incomplete information, leading to an inappropriate construction process and increased risk of failures.
3. An inappropriate construction process would include inappropriate construction planning, control, operation, and site condition, recognising the idea of a latent failure (Reason, 1990); and inappropriate operative action, often providing, in Reason's terminology, the triggering event.
4. Consistent with a system dynamic, the structure of the model creates a multiple path domino sequence in which a construction failure may have multi-factorial sources.

In this case, integrating the project team into the procurement process is defined as overall attempts throughout project development process by any parties involved to plan safety

measures, to design out and then to control any potential undermining factors to safety and health during production operation on site. The principles of the total safety management are as follows:

1. Comprehensive planning and designing as well as controlling out by tracing any potential factors undermining safety throughout project stages from project concept, project planning & design, and to project construction,
2. Determining by taking into account project participants' role, who could reasonably plan, design out and control those factors by taking any actions to eliminate, reduce or ovoid their potential to occur,

The Construction (Design & Management) Regulations, known as CDM, came into force on 31 March 1994. The principal features of CDM are as follows:

1. All parties to the construction project, including the client, have specific duties regarding health and safety during the execution stage of the project.
2. A new duty-holder has been created, the Planning Supervisor, who is the health and safety co-ordinator during the project planning stage.
3. All those who carry out design work associated with the project have duties to ensure that health and safety is taken into account and that appropriate co-ordination takes place and that information is produced.
4. The health and safety plan and the health and safety file have to be prepared. The plan is for use during project tender and construction stage. The file is for use during any subsequent works on the project, including eventual demolition.

With the changes duties, the designers need new skills to enable them to carry out the following:

1. They need to be able to identify the hazards presented by potential design solutions and consideration about the risk of these hazards will generate for construction workers and others who may be affected by the construction works (e.g. members of the public).
2. They need to be able to include health and safety considerations amongst the design options so that they can avoid hazards, reduce their impact or introduce control measures to protect those at risk where it is reasonably practicable.
3. They need to be able to judge which of the remaining hazards is significant or unusual enough to be brought to the attention of the contractor.
4. They should to be able to document all the decisions and the results of discussions to be able to show at later date that the Regulations were complied with, should a dispute arises.

Munro (1996) explained that The CDM introduces a new approach and commitment to managing construction projects and places new duties upon clients, designers and contractors. The Regulations ensure that health and safety is taken into account and then co-ordinated and managed effectively throughout all stages of the construction project: from conception, design and planning through the execution of the work on site, maintenance and demolition. An analysis by HSE of the main causes of accidents revealed that most of the accidents were due to the following reasons:

1. A lack of supervision by line managers in the industry. It was felt that the wide spread use of subcontractors and self-employed labour led to problems of management and control.
2. Customs and practises in the industry were not equipping workers to identify dangers and take steps to protect themselves.
3. A lack of co-ordination between members of the professional team at the pre-construction stage.

Under this regulation every party involved in the building procurement has a duty and responsibility to enhance health and safety. One of the most significant changes brought about by the Regulations to the composition of a project team is the appointment by the client of a planning supervisor. The client appoints the designer and principle contractor as current practises but with certain additional duties with respect to health and safety. Clients must be reasonably satisfied with the competency of the people used and that they have sufficient resources including time allocated to enable the project to be carried out in compliance with health and safety law. The Planning Supervisor has the overall duty/responsibility for co-ordinating the H&S aspects of the design and planning phase. He must monitor the H&S aspects of the design, and then advises the client on the satisfactory allocation of recourses with respect to H&S and to ensure that an H&S Plan is prepared. The Planning supervisors are expected to advise whether the H&S Plan is sufficiently complete for the client to permit construction to proceed. On completion of construction, he must ensure that H&S file is compiled for each structure. Designers must design in a way, which avoids, reduces or controls risk to H&S in so far as is reasonably practicable so that the projects can be

constructed and maintained safely. Risks that remain must be stated to the extent necessary to enable reliable performance by a competent contractor and included in the H&S Plan presented to the Principal Contractor. The Principal Contractor should take into account of the specific requirements of the project when preparing and presenting his Tender or similar documents on award, and take over and develop the H&S Plan to permit construction to commence. Thereafter he must co-ordinate the activities of all other contractors and subcontractors and ensures that they comply with relevant H&S legislations and with the developed H&S Plan. The Principal Contractor also has duties in relation to provision of information, training, and consultation with employees including the self-employed.

Contractors including self-employed are required to co-operate with the Principal Contractor and provide the latter with details on the management of H&S in their work. They also have duties in relation to the provision of other information to the Principal Contractor which might affect other employees or the general public. Health and Safety Plan serves two basic purposes. During the pre-construction phase of a project, the Plan brings together H&S information obtained from the client and designers and where appropriates the Planning Supervisor. The H&S Plan during the construction phase draws on the Principal Contractor's H&S Policy and risk assessments, and the details of the management and prevention of H&S risks created by the contractors and sub contractors. The H&S Plan will continue to evolve as construction progresses to provide a focus for the coordination of H&S. Health and Safety file amounts to a normal maintenance manual enlarged to alert those who are be responsible for the structure after handover, to risks that must be managed when the structure and associated plant is maintained, repaired, renovated or demolished. It is a record of information to inform

future decisions on the management of H&S. The following figure shows relationship between various duty holders and the importance of Health and Safety Plan which is the main link between the Planning Supervisor and the Principal Contractor.

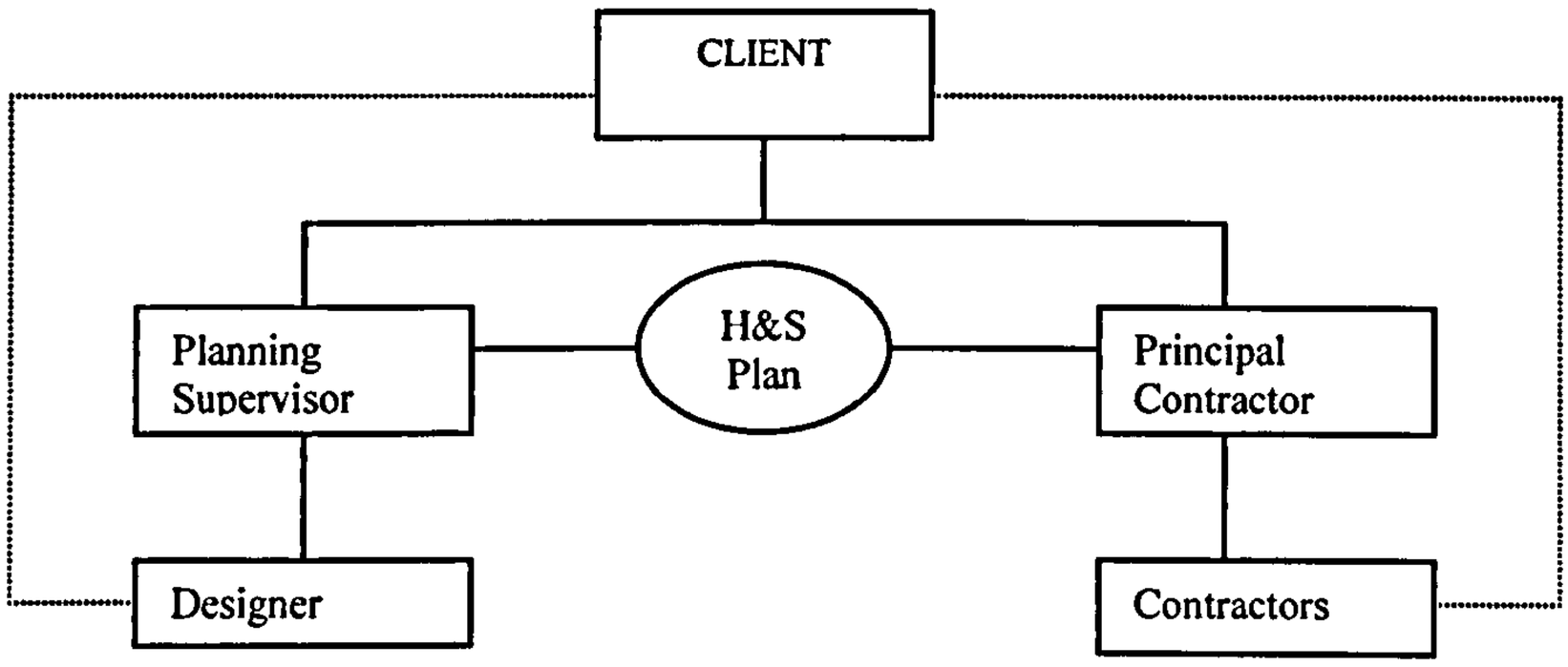

Figure 4.2 Relationships of Duty Holders in Health & Safety under CDM

The main requirements of the Regulations many of which are qualified by reasonable practicability are as follows:

Client:

- Client to appoint a competent Planning Supervisor and principal contractor,
- Client to satisfy himself that those he appoints are competent and will make adequate provision for health & safety,
- Client to provide Planning Supervisor with information relevant to the state of the premises,
- Client to take steps to ensure Health and Safety File on the finished structure is kept available for inspection.

The Designer:

- Ensure Client is aware of Client's duties,
- Ensure that the design avoids foreseeable risks to persons who do construction, or maintenance work,
- Ensure the design includes adequate information about structure or materials,
- Co-operate with Planning Supervisor.

The Planning Supervisor

- Ensure the design includes considerations and information required in duties on Designers,
- Take steps to ensure co-operation between Designers,
- Ensure that H&S Plan is prepared before the construction phase,
- Give adequate advice to client on competency and provision of adequate resources,
- To ensure H&S File is delivered to client on completion of project.

The Principle Contractor:

- Co-ordination of all the activities of contractors
- Ensuring that all comply with H&S Plan
- Ensuring that all contractors are provided with relevant information on risks and training

Other Contractors:

- Co-operation with the Principal Contractor
- Provision of information to the Principal Contractor

- Complying with direction of the Principal Contractor

4.6 Summary and Conclusion

Rethinking construction safety should be a matter of concern for all project participants. Enhancing safety practice in construction means to make clients, the client's project team, designers, constructors as well as operatives to be aware of their role in improving safety performance of construction. It means that the design-construction integration should be expanded to be inception-design-construction integration in which a long term partnering among project participants is essential.

Approaches to safety research can vary according to which problems or issues related to cope with. However, in principle safety research is to understand the phenomena and then try to propose how to deal with improved safety in particular. The approaches can come from different perspective, for instance accident causation, or systems in which safety becomes important aspect to address as well as individual and organisational setting for improved safety. This research focuses on enhancing safety practice in the construction industry through improving procurement process in which client leadership and commitment as well as project team integration are of important issues. For this purpose, the research framework lies on procurement process and parties involved particularly client leadership and commitment in enhancing safety practice across project procurement.

Furthermore, the research framework is concerned with the nature of procurement and its implications to improved safety. As with the theories underlying this work have been

elaborated in Chapter 2, 3 and 4, nature of procurement, the client leadership and project team integration are regarded as variables to enhancing safety practice in the construction industry. A model to construct these variables is presented as the procurement process, client leadership and commitments as well as project team integration are independent variables affecting safety practices. It is envisaged that these variables will be identified through case study analysis. Further research strategy and methodology is then presented in the next chapter.

CHAPTER 5: RESEARCH METHODOLOGY - JUSTIFICATION

5.1 Introduction

This chapter describes the justification of case study as the research methodology. The justification of using case study methodology is to fulfil the objectives of this research as stated in Chapter One.

5.2 Quantitative verses qualitative methods

According to Ghauri et. al. (1995) research method is defined as the systematic focused orderly collection of data for the purpose of obtaining information to find solutions to research problem or answer research questions and the suitability of techniques and methods is dependent on the research problem and its objective or purpose. Basically, research can be quantitative or qualitative or both. There have been many discussions, debates regarding the advantages and disadvantages of both qualitative and quantitative types of approaches in research.

5.2.1 Quantitative methods

Quantitative research methods are used in addressing problems or questions related to what, whom, where, how many and how much, and normally used to measure the incidence and prevalence of a phenomena. The results of the study using quantitative method are representative and broadly generalised information about a particular population. Quantitative methods need a proper and adequate amount of sampling and these represents the

measurement of many subjects' reactions to a set of questions which are designed to fulfil the study objectives.

Table 5.1 Difference in emphasis of qualitative v quantitative methods

Qualitative Methods	**Quantitative Methods**
Emphasis on understanding	Emphasis on testing and verification
Focus on understanding from respondents'/informants' point of view	Focus on facts and/or reasons of social events
Interpretation and rational approach	Logical and critical approach
Observations and measurements in natural settings	Controlled measurement
Subjective insider view and closeness to data	Objective outsider view and distance from data
Exploitative orientation	Hypothetical-deductive; focus on hypothesis testing
Process oriented	Result orientated
Holistic perspective	Particularistic and analytical
Generalisation by comparison of properties and context	Generalisation by population membership

Source: Robson and Colin (2002)

5.2.2 Qualitative method and its relevant to research

Qualitative approaches have been identified as more appropriate to research questions and problems faced in management and work context (Bryman, 1988; Easter-smith, 1991; Cassell and Simon, 1994). Previous research maintained that qualitative methods are more appropriate to research which focuses upon organisational processes, as well as outcomes and trying to understand both individual and group experiences of work (Cassell and Symon, 1994). In this research, the unit of analysis is a construction project under certain procurement

system. The main goal of the case study was to describe accurately and completely all features on how safety matters can be addressed in the procurement process of selected cases.

This research was all about identifying and understanding what is actually taken place in the procurement process of a construction project regarding many issues of health and safety. It involved recording all activities, actions taken by the key players regarding health and safety right from the early stages of the project until the end of the project. The nature of the research, which deals with activities concerning health and safety, means to look at the 'real-world' situation. This qualitative research was to investigate what going on in the procurement process, to identify the real phenomenon and to understand the problems and constraints faced by all key players in playing their role in the issue of health and safety. Understanding the current phenomenon which is going on in the procurement process regarding health and safety requires a qualitative approach. The collection, dissemination and interpretation of information relating this phenomenon, is the main objective of this research. Qualitative research approaches have traditionally been favoured when the main research objective is to improve our understanding of the phenomenon, especially when this phenomenon is complex and deeply embedded in its context (Audet and d'Ambroise, 2001).

1.2.3 Reasons using case study approach

In this research, the approach was to embark on multiple case studies, both in the UK and in Malaysia. This is relevant to the objective of the research itself, which focuses on the 'real-world' phenomenon. 'Case studies focus on one instance (or a few instances) of a particular

phenomenon with a view to providing an in-depth accounts of events, relationships, experience or processes occurring in that particular instance' (Denscombe, 1998).

This research deals with how procurement process could be used to enhance safety practice in construction. An appropriate research methodology should, therefore, be selected to unveil the detail of procurement process, project team integration, the potential role of project participants particularly client who is the main actor in the procurement process in improving safety practice. As with qualitative research, this research used methodology through a case study. This case study was made to investigate, identify and compare the Malaysian and UK construction industry efforts in enhancing safety practice.

Case study is universally accepted as a robust methodology to gather insight of phenomena. Bromley (1990) defined case study as a systematic inquiry into an event or a set of related events aimed to describe and explain the phenomenon of interest. Objects of the case study or the unit of analysis can vary from an individual entity or activity to even a group of individuals or activities, such organisation, corporation or interrelated activities. The term 'research method' means ways to go about and think about research and research design. The use of these methods creates the overall research project design. By recording the design of the research strategy within a research 'protocol' the work can be both audited and replicated, if desired, as far as individual case studies permits. The potential replicability raises the level of validity and rigour of the case (Yin, 1984). By utilising a multi-method approach to evidence collection for the case studies (including multi-cases), convergence in findings will improve reliability (Yin, 1984). Yin (1989) cites that a case study has been defined as trying to illuminate a decision or set of decisions and why they were taken, how they were

implemented and with what results. In the context of this research, the actions, decisions taken by all parties at specific stages of the production process will be scrutinised and compared to the 'theoretically ideal' practises recommended by the government in their initiatives to enhance health and safety practices. Yin describes the unique strength of the case study as: "*is ability to deal with a full variety of evidence...*" and includes in this both documents and artefacts, thus highlighting the overlap possible between case study and archival research. Yin (1985) cites that a case study is an empirical enquiry that: investigates a contemporary phenomenon within its real life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple source of evidence is used. In the case study design Yin (1994) includes; identifying the studies questions, propositions, unit of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings. Based on the strategy recommended by Yin, the research will take the following form:

- An empirical enquiry into the contemporary phenomenon of implementing health and safety in the production process by all parties/players; and
- Multiple sources of evidence will be used.

According to Bryman (1989), in validating data, several methods can be used: semi-structured, structured and unstructured 'interviews'; survey 'questionnaires' participant and structured 'observation'; and 'archival sources' of data. In this research two methods were anticipated; asking questions and analysing documents. Techniques of asking questions are structured and semi-structured interviews, informal discussions and written questionnaires. The use of interview technique to elicit knowledge in this research is to gather primary data

regarding the actions, perceptions, ideas of parties as described before and also as validation of findings from document analysis. There are shortcomings in interviews as Sommer and Sommer (1980) describe as follows:

> "*What the people say is not always what they do. The information obtained in interviews is limited to the spoken contact and to inferences made by the interviewer. The data are highly subject to bias introduced by the human interaction of the interview process. While no research method is absolutely free of subjectivity, the interview is more open to bias than most research methods. However, this is not to say that is inevitable*".

Careful construction of the interview questions can help to minimise if not overcome the problem. Triangulation of data also helps to eliminate the shortcomings. It is intended to have a well-structured interview at specific stages of the production process with parties involved. In case studies historical documentation can provide a useful source of information about policy and organisational practices. In this research project tender documents, appointment procedures, site meetings, safety records etc. were crucial for the purpose of understanding the background of the projects, organisations and policies. The advantage of multiple case studies is that the results can be compared. Carroll and Johnson (1990) support Yin's proposition that the defining feature of case research is that the primary goal is to understand the case itself; only later might there be efforts to generalise from the case to broader principle. Case research often utilises interviews with key actors and other informants, onsite observation of events, the collection of written documents, library research, reading personal papers, biographers' reports, and whatever else the researcher can use as sources of

information. It is advantageous to plan case research with comparisons in mind, for example, from research what has previously been done, or to hypotheses drawn from well-formulated theories, or by selecting two or more cases that span some dimension of interest such as large versus small or successful versus unsuccessful. Allen (1997) summarises potential weaknesses in case study as follows:

1. The problem of access which is critical and must be maintained to complete a case – study successfully
2. Lack of rigour, due to combination of sloppiness, equivocal evidence and biased views to influence the work and empirical requirements of data collection.
3. There is little basis for scientific (statistical) generalisation.

Allen (1997) suggests a few steps to overcome the problems, as follows:

1. By completing a full design of the research protocol i.e. a planned course of action, this is to overcome 'sloppiness' of the framework i.e. to set up a rigorous framework.
2. By the inclusion of a pilot study. Pilot study is valuable because it "...*may reveal in adequacies in the initial design...design could be altered and revised after the initial stages of the study...*" (Yin 1985).
3. By using a multi-method (including multi-sources) approach to evidence collection. In this research, this will include interviews, archival analysis (studying documents) and observations (e.g. in meetings, if possible).
4. By laying down an audit trail: Yin promotes various tactics for overcoming bias, amongst them is following a reliability audit: i.e. setting out procedures for

subsequent researchers to follow a chain of evidence (the protocol); and by exposing preliminary findings to critical questioning.

5. By accepting the validity of case study findings based on non-statistical (analytical) generalisations and through the use of other cases as a checking measure.

The purpose of using multiple data collection techniques (interviews, document analysis and observation) is to gain as much as possible the understanding of the problem in the implementation of health and safety by all parties at specific stages of the production process. The outline for collecting the data is important. This is the case study protocol. The research sought to study the actions taken by all parties at specific stages of the production process in other to understand their knowledge, perceptions, cooperation and other relevant issues regarding the implementation of health and safety. These questions deal with existing or real situations and a framework to conduct this investigation is required. The protocol is a document, which provides a theoretical, empirical and practical basis for a successful case study investigation. Yin (1984, 1994) identifies four elements of research in a protocol: design, data collection, analysis and reporting. Yin (1984, 1994) identifies five components of research design.

1. The studies question of what the existing and prevailing standard of practices regarding health and safety by all parties in the production process.
2. Propositions described.
3. Unit of analysis of the actions and practices of all parties and measurement of safety culture.
4. The logic linking the data to the propositions.

5. The criteria for interpreting the findings.

Yin (1984, 1994) indicates that case studies can be used in organisational and management studies, for the study of management decisions and processes. Denscombe (1998) states that case study research characteristically emphasizes the following points:

- Depth of study rather than breadth of study
- The particular rather than the general,
- Relationships/ process rather than outcomes and end- products,
- Holistic view rather than isolated factors,
- Natural settings rather than artificial situations,
- Multiple sources rather than one research method

Yin (1994), ' a case study has been defined as trying to illuminate a decision or set of decisions...why they were implemented and with what results.' Also a case study research consists of a detailed investigation, often with data collected over a period of time, of one or more organisations with a view of providing an analysis of the context and processes involved in the phenomenon under study (Hartley, 1994). Yin, (1994) has developed a definition of the term case study as an empirical enquiry to investigate a contemporary phenomenon within its real life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used.

Hartley (1994) identifies key tasks in undertaking case study research as follows;

- Choosing the case study

- Gaining and maintaining access
- Choosing an initial theoretical framework
- Collecting systematic data
- Managing data collection
- Analysing the data
- Leaving the case study

As for Yin (1994) the case study design includes identifying the studies questions, propositions, unit of analysis, the logic linking the data to the propositions, and the criteria for interpreting the findings. According to Yin (1994), a sample selection should be dictated by the replication logic instead of a statistical one. More precisely, each case should be considered as an experiment by itself, subsequent cases being used either to confirm or refute previous findings. Cases should therefore be selected if there are expected to yield similar results (literal replication) or on the contrary, completely by opposite results (theoretical replication) according to theory. According to Eisenhardt (1989), 'cases may be chosen to replicate previous cases or extend emergent theory, or they may be chosen to fill theoretical categories and provide examples of polar types'. Based on the above, three criteria are selected for the case study. Those criteria are different country, different types of client either of public and private and different procurement method.

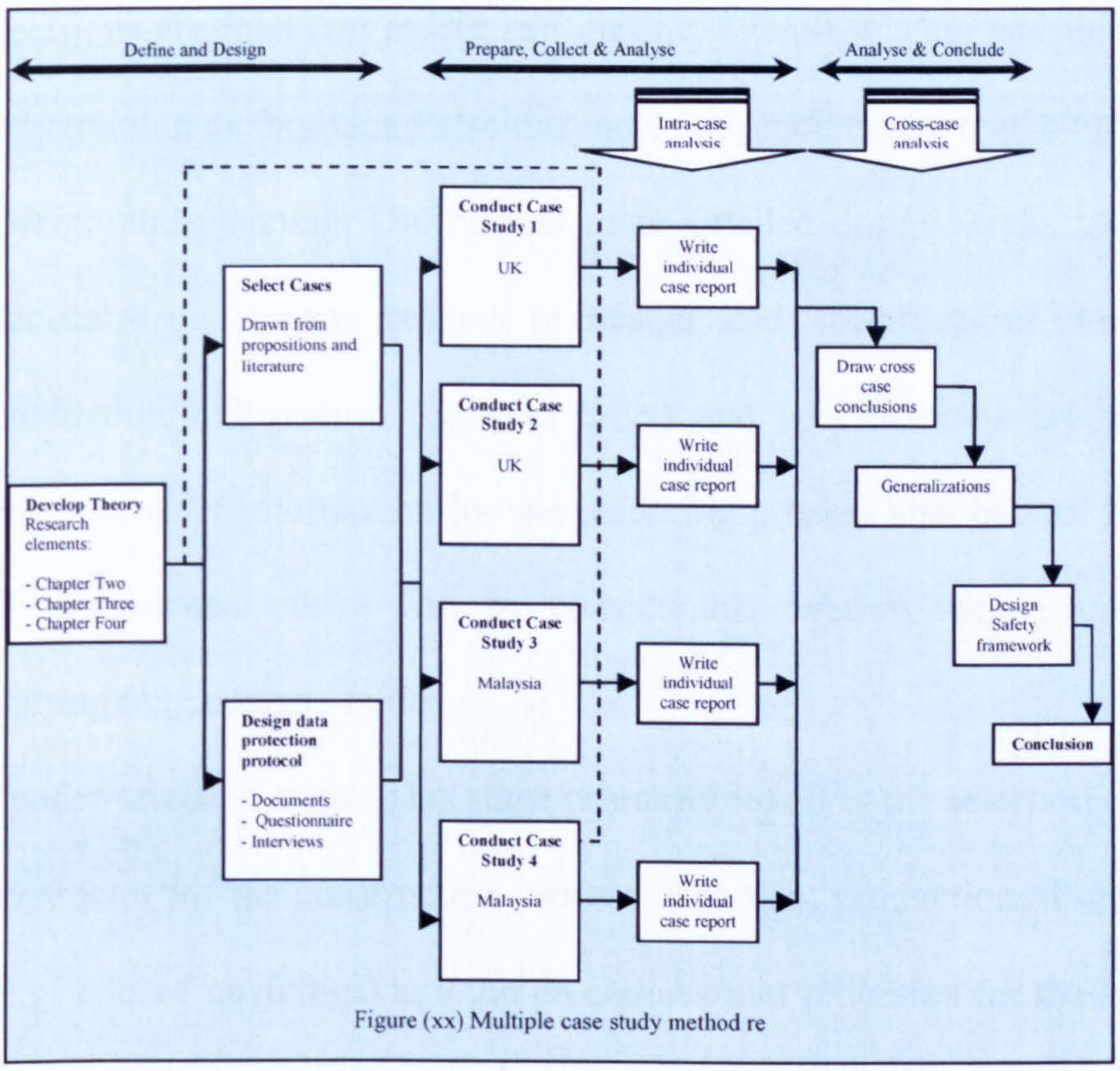

Figure (xx) Multiple case study method re

Fig.5.1 Multi-case study method replication

5.3 Case Study Framework

In order to have a systematic study of the phenomenon going on in the case studies, a framework or guidelines are needed to ensure everything is recorded. Therefore in these cases, the stages of the projects are divided into 4 stages, which is common for projects both in Malaysia and UK. At all the stages, the perspective of all parties is investigated to show the impact not only the implementation of health and safety but on the role of client leadership, team integration and other relevant issues. The following are the stages:

- Concept and feasibility: This stage begins when the client first thinks about having a structure built, repaired, refurbished, demolished or maintained. It overlaps with the start of detailed design work. During this period important

decisions are made on layout and outline, overall scheme and initial design and construction methods, and also the choice of procurement method to be used.

- Design and planning: During this stage detailed design works take place. Final decisions on matters related to design and specifications are made. Final production information (e.g. drawings) and specifications are produced. The preparation of information for the tendering process also begins. For some form of procurement, there will be considerable overlap with actual construction starting (e.g. design –build).
- Tender/selection stage: This stage primarily involves the selection of the principle contractor for the construction process. The final production of tender document (e.g. bills of quantities) and the procedures and processes for the selection of the principle contractor take place.
- Construction phase: This stage covers the time for the principle contractor to plan, programme and prepare the construction work. Arrangements are made to start the work and then carry out and manage it.

In this approach, the whole process activities, right from the inception to construction of a project were analysed to obtain the required data for the study. The process approach gives the opportunity to look into each activity at every stage in the procurement process while keeping in view the targeted objective i.e. in this case to achieve high standard of health and safety in the project. Health and safety achievements are not only represented by a favourable statistic at the end of a project, but also changes in safety culture, implementation of best

practises at all stages of a project, which are more significant because of the involvement of all parties in the design stage of the procurement process.

Through process approach, activities at different stages of the process were the focuses instead of looking into different professions and their activities. The focus on specific activity zones in the procurement process especially relating to the implementation of health and safety gives the opportunity to analyse critically the parties involved in that particular activity zone. In the individual activity zone, the parties involved, what are their functions relating to health and safety, how do they integrate with other team members, and other relevant issues will be scrutinised.

Firstly and obviously, there were cases in Malaysia and UK being selected to represent two different sets of studies. Each country will represent a different set of conditions, legislations, policies, other variables for comparison purposes. Situations in both countries were compared to highlight any similarities or differences as this would provide a foundation for suggestions, recommendations for both sides.

In any country, clients for the industry are basically two types, namely public and the private sectors. In this research, it is intended to highlight the role of the public client, i.e. the government itself, which in the case of the UK and Malaysia is the most influential client, the procurer, the initiator of projects. Both governments have taken serious steps towards improving the construction industry and were an interesting case study to highlight their roles in the promotion of health and safety practices in the industry. It is also an opportunity to

compare between a developed country and a developing nation on how they look into this important issue.

Other criteria were that the cases adopted different type of procurement methods. Rwelamila and Smallwood (1999) conclude from their study that incorrect choice and use of procurement systems has contributed to neglecting of health and safety aspects by project stakeholders. Loosemore et al. (1999) maintain procurement issues are important in health and safety as power balances between designers and contractors who collectively responsible for health and safety performance. Dregger (1996) agreed that the form of construction delivery affects contractual relationships and the development of mutual goals.

Fryer (1997) relates the importance of change in attitudes of all parties for construction to become healthier and safer. In the respect of procuring a job, the client must accept that there is a 'health and safety premium' to pay in the cost of construction; that if getting rock-bottom price means that people will be killed or seriously injured, then the price is too low.

According to Smallwood (1996) market conditions in South Africa are such that contractors frequently find themselves in the iniquitous position that should they make the requisite allowances for health and safety, they run the risk of losing a tender or negotiations to a less committed competitor. Meere (1990) advocates the integration of design and construction as a contribution to improving health and safety. Dregger (1996) recommends the design-build contract form, as context of sustainability, health and safety included. It establishes one entity

to provide both design and construction which has the greatest potential for success as it creates common project goals.

This research is about studying the entire procurement team right from the early stages. Due to the fact that, each individual of key-player has its own roles in the procurement process, it is important to be able to contact them in the course of the study. Their views, actions, perceptions regarding health and safety were of prime importance to the study. Their experiences in the project will reflect the phenomenon regarding leadership, team integration and health and safety in the cases. Ongoing projects made it possible to be in the 'real-situation' e.g. attending site meetings, discussions and will make the research more 'realistic'.

In the Malaysian context, interviews, questionnaires, discussions can be conducted in a wider scope to include important policy makers in the government, CIDB, academicians, professional institutions. This will have a broader feed-back from those interested in the issue of health & safety. Another reason is that there are very few empirical studies about the health & safety in the Malaysian construction and this is an opportunity to "keep the ball rolling"' and hopefully will become the impetus for further research.

The target to make the government as the best practise client through procurement process has been laid down in the Construction Procurement Guidance (OGC) NO. 10 and can be used as a 'testing tool' to look into each procurement process via the process protocol. The recommended basic principles to be considered as best practise are;

1. Demonstrate a high level of commitment to health and safety through unambiguous policies, senior management action and compliance with statutory health and safety requirements;
2. Carry out rigorous assessments of candidates to establish their competency and adequacy of their resources as well as commitment to continuous improvement in health and safety during the selection process;
3. Know their current safety performance and continue to set increasingly demanding but realistic targets against which they can measure their ongoing performance and that of their suppliers;
4. Create, and early stage, an integrated supply team and especially ensure that the design and construction aspects are properly considered before construction work starts;
5. Provide sufficient time to carry projects safely;
6. Ensure that there are sufficient resources;
7. Ensure that there is good communication between key parties; and
8. Create an environment where everyone, including workers, can put forward suggestions for improving health and safety performance.

Careful choice of cases is important to ensure they represent enough diversity in order to have a general conclusion at the end of the study. The advantage of multiple case studies is that the results can be compared. Carroll and Johnson (1990) support the idea that defining feature of case research is that the primary goal is to understand the case itself; only later might there be efforts to generalise from the case to broader principles. Figure 5.1 summarises the

frameworks of the case study. The first case study in this research was carried out for the construction projects in the UK. The second case study was then undertaken in Malaysia. In this case, the researcher expects to get insight how the developed country such as the UK improves health and safety practices through appropriate process in the building procurement. Furthermore, the insight will be used to understand the development of safety and health practices in developing country such as Malaysia. The reason why the UK cases were selected is that this country is well known in the enforcement of health and safety practices through the application of the CDM regulation. It will be a good example for another country like Malaysia to learn valuable lessons from the practical point of view.

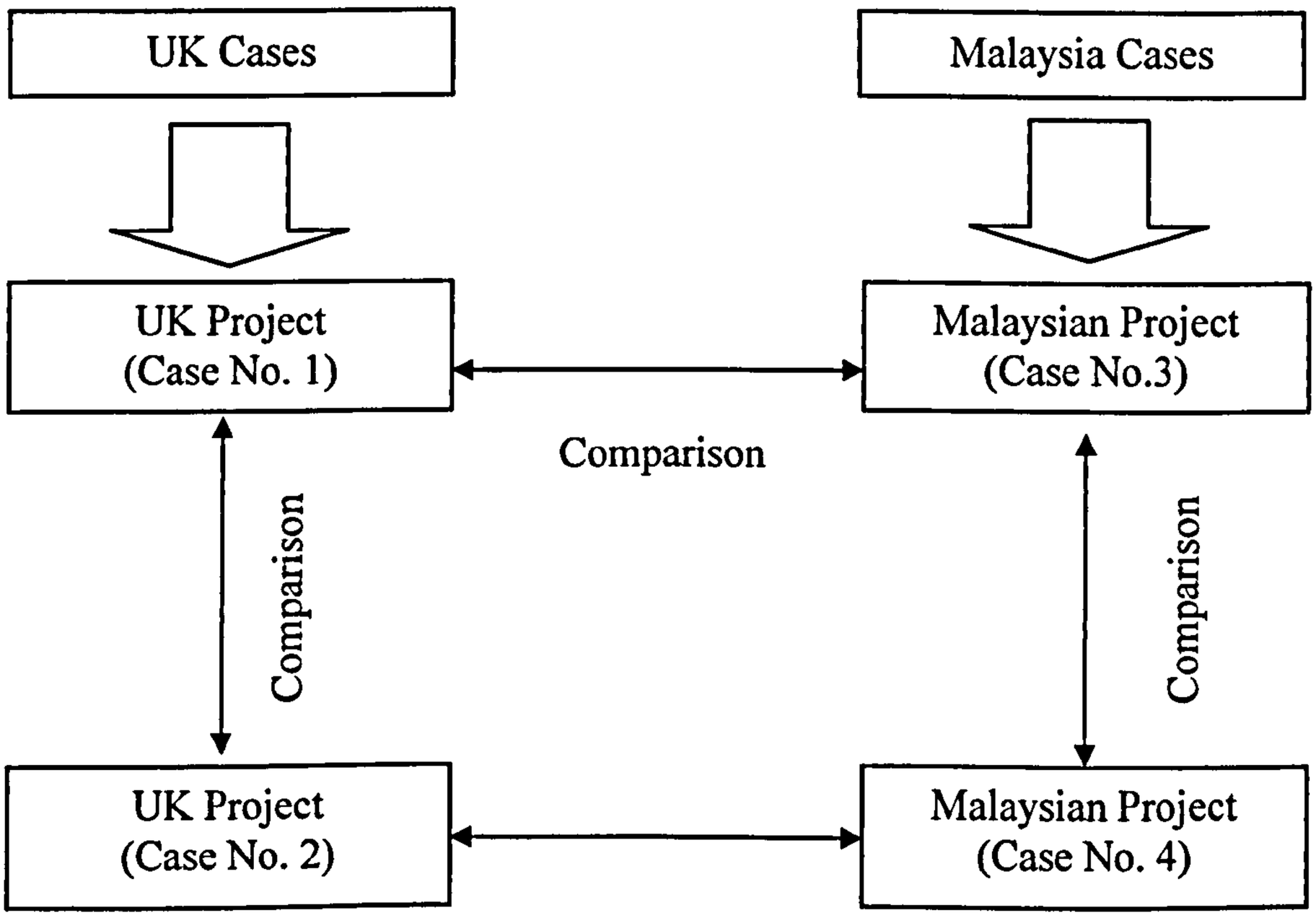

Figure 5.2 Cross-case analyses between 2 countries

Chapter 5: Case Study As A Research Methodology

The objective of the research was to explore, understand and explain the phenomenon in the procurement process regarding health and safety. It is a study to understand the role of key players relating to health and safety in the procurement process. The research involved mapping all the activities regarding health and safety in the procurement process. The efforts taken by all parties during the procurement process to enhance health and safety or lack of it were the specific focus of this research.

The initial and subsequent literature reviews show that in both countries, Malaysia and UK, legislations were introduced to act as the main driver of change in the industry. In the UK the introduction of CDM is a big step forward in changing the myth that the contractor is the only party responsible for health and safety. At least its introduction has made it compulsory for all parties to be responsible for health and safety. Malaysia has a long way to go before such kind of legislation can be enforced; therefore, this research focuses on procurement route as an important driver to change the safety culture of all parties in the procurement process. This research embarks on the qualitative tradition. Propositions were established instead of hypotheses, which are more related to quantitative type of research.

In order to show the role of government in enhancing health & safety, to measure the success of various government initiatives and strategies, the choice of public project(s) in the case study was the main focus. In the Malaysian context, the role of government is to 'stimulate' cultural change, make it more important to use government projects as case studies.

Encouraging small firms/companies to look seriously in health and is one of the UK government's targets (10 points Strategy Statement in Revitalising H&S). Therefore it is important to include small project in the case study. The 'real' situations in the implementation of health & safety in both big and small projects can be critically studied.

Case studies in the UK were used as a basis of comparison with cases in Malaysia. The health and safety issues in the procurement process were analysed using the case studies in UK as the 'role model'. The 'success' of the UK government in implementing health and safety in public projects will be a 'benchmark' for Malaysia. The focus being on public projects is more significant. Therefore, it is worth to obtain some insights, on:

- The important and significant roles government can play in improving health & safety;
- In the UK, the efforts done by government are well established and has been practised for sometime;
- Lessons can be learned and some procurement policies, procedures can be adopted by Malaysia; and
- Malaysia and UK has the same procurement process due to historical background that the public procurement system is based on the UK model.

The theoretical framework was essential to be used as a starting point for investigation, as guidance for the first steps in the field. Other variables may also be considered during the study. Therefore this type of research can be considered as inductive and it is aimed at theory building. Based on the literature review, propositions were then established. Propositions

were used instead of hypotheses because hypotheses are related to quantitative approach of the research. Hypotheses are seen as being derived from scientific theories, which are submitted to empirical test. If they fail the test it is necessary to revise the theory. The implication of this is that science is deductive. These propositions were used as the structure, a frame of reference, for the investigation into the procurement process regarding health and safety practices.

5.4 Research Questions and Establishing Propositions

In this research, special focus will be on public sector because in any country, the government if not always the biggest but surely one of the most influential employers. The special and unique position of the government makes it a great potential to influence the industry. Government as the biggest procurer has great influence on the economy and has used this as a tool to achieve national policies. One of the objectives of this study is therefore to look into the influence of the government regarding health and safety policy in the construction industry. In this study, the researcher is interested in determining the outcome of government policy regarding health and safety. It is important to study the public sector in order to make valuable comparisons regarding policy, implementation, success rate and other relevant issues regarding health and safety practices. The question can therefore be summarised as:

How does the government as procurer, regulator, and client and policy maker uses its power, influence to improve health and safety practices in the industry? This contributed to the establishment of the first proposition as follow:

Proposition 1: The greater the involvement of client, in the earlier stages of the production process, the more impact they will give in enhancing health and safety practices.

This first proposition directs that through procurement process, there are opportunities for all parties to utilise their capabilities, roles in enhancing health and safety. Procurement is a better way than legislation to improve safety culture of all parties in the procurement process. This means a detailed study at every stage of the procurement process needs to be conducted to understand, highlight any gaps, constraints faced by all parties in utilising procurement to achieve better health and safety practices.

Data needed: Overall detail of the project. The cost, duration, parties involved, tender documents, project documents, policies regarding health and a safety, procedures regarding the appointment of consultants, minutes of meetings, and other relevant documents concerning policies, actions regarding health and safety practices

To 'measure' the effectiveness of government policies, initiatives need to illicit feed-back from all parties. Cultural change, perception, ideas, commends need to be explored. In the procurement process, there is adequate opportunity for the client to exercise their power, influence to have positive impact on health and safety. In his research, Smallwood (1996) concludes that the contractors in South Africa had little opportunity to allocate higher budget for health and safety in their bids because of the risk of losing the tender. This is normally in the traditional type of tendering whereby the lowest tenderer is almost certain to win a contract. This will result in no incentive at all for contractors to consider health and safety aspects in their costing of a project.

Smallwood (2000), in his study concerning South African construction procurement, suggests that equitable allocation of resources to health and safety at tender or negotiating stage can be realised through the provision of provisional sum for health and safety in the bill of quantities. This can only be done if the client understands the important of health and safety in relation to quality and productivity and does not consider investing in health and safety as a bad investment.

The UK government has realised the importance of investing in health and safety and has come with various initiatives following the Egan Report. Among others, the Value for Money Policy, Procurement Best Practise, and Key Performance Indicator (KPI) were all designed to improve the performance of the industry following Latham and Egan Report. It is also part of the study to analyse the success of these initiatives, especially to see how the policy of value for money is implemented in government jobs, instead of the normal 'lowest-cost' consideration in selecting contractors.

In the procurement process, another important issue is the selection criteria of contractors. How much importance has been given to health and safety in choosing a contractor? What about the pre-qualification process? Any written policy about health and safety? These are some questions to be answered in the study. In the issue of health and safety, there are legislations, regulations and laws to be enforced. Through this legislative route, or as a driver to enhance health and safety, there is always a question of implementation success, cultural change that is expected and it is the intention of the researcher to explore this and compare with the use of procurement as an effective tool to enhance health and safety practises. In the

UK, the introduction of CDM has made positive impact on the acceptance of responsibility by all parties in the production process. But this study is to explore the use of the procurement process as a tool to enhance the implementation of CDM and along the way 'measure' the effectiveness of CDM as a driver for health and safety. Therefore the next question is how does procurement process be used as an effective tool to enhance health and safety? This leads to the second proposition of;

Proposition 2: Procurement is a useful tool to enhance health and safety in the industry.

The second proposition is that procurement is a stronger driver than legislation to enhance health and safety in the industry. This second proposition implies that clients with better leadership quality would result in better management of the health and safety. Clients play the most important role in changing the team's safety culture. The better the understanding, concern about safety by the client will have great impact on the team's perception on health and safety. In this research a thorough study on the client's action, from the early stages of the procurement process was recorded to understand the phenomenon in a real life project.

Data to be collected: The existing legislations, laws, regulations imposed on projects concerning health and safety. The effect of the legislation i.e. in the UK the CDM, its impact, to measure effectiveness by looking at project/case reports on implementation, problems encountered to implement CDM. Acquiring feedback via interviews, questionnaires from parties involved concerning procurement method used to see whether it can really enhance health and safety practices. Feed-back specifically on the introduction of provisional sum to cater for health and safety in the BQ (as suggested by Smallwood). How through procurement, the best consultants, contractors can be selected to improve safety.

Team integration is one of the focuses of the construction industry following the Egan Report that showed the importance of this issue in order to deliver the best product and to achieve the objectives of the client. The roles of all the parties concerning health and safety have been highlighted by Smallwood (1998, 2000), O'Reilly et al (1994), Jeffery and Douglas (1994) and Hinze and Gambatese (1994). In this research it is intended to study the degree of integration of the parties involved especially during the design stages, which are crucial to achieve any common objectives of the project.

Following Rethinking Construction the Strategic Forum for Construction set up by the UK government in Accelerating Change has identified important drivers to secure a culture of continuous improvement. The first is the need for client leadership or supporting client leadership. Clients should take the lead when procuring construction services through an integrated team on the basis of value and quality, not lowest initial cost. To support the role of client some suggestions have been made as follows;

- The need of independent, expert advice for clients has been identified as being vital to providing wider solutions to client's needs.
- Clients should lead and actively participate in the creation of integrated teams.
- Clients through their actions should create an environment throughout all stages of the project which delivers excellence in health and safety performance.

The second is supporting integrated Teams. To maximise value for money, integration of teams from the beginning is vital, and the client has an important role to play. Through integration and cooperation only, the common goal, in this case achieving excellence health

and safety practices for the projects can be achieved. The parties involved in the production can make significant impact on the issue of health and safety when they can work together in earliest possible opportunity during the production process. Therefore the last question in this research is how can the team be integrated in order to produce the intended objectives of the project and the proposition related to this issue is;

Proposition 3: The greater the degree of team integration the better will be the health and safety performance. This third proposition describes that good team integration right from the early stage of the procurement process would produce better health and safety management. The word 'team' means all parties, the client, designers, planning supervisor, contractor, sub-contractors and suppliers. The real challenge in the procurement process is to make all the team to have the same objective, understanding, perception about health and safety. Team integration also means to look into the partnering concept not only between the client and contractor but also contractor and sub-contractors and suppliers. This research looked into how team integration helps the flow of information, instructions or policy regarding health and safety right from the upstream i.e. the client until down to the suppliers and sub-contractors.

5.5 Criteria in choosing case studies

Criteria 1: Public project both in UK and Malaysia. This is to study the performance of both governments in UK and Malaysia relating safety issue in the procurement process.

Criteria 2: Difference types and sizes of projects in UK and Malaysia to have better study of the differences in implementing safety

Criteria 3: Cases / projects with different kind of procurement methods – traditional and design-build

Criteria 4: 'Live' project/case because of pragmatic reason i.e. to get in touch with all parties.

The cases or projects that are to be selected will be based on the criteria stated above. These criteria are linked with the questions established based on the literature review and also the propositions established which reflects the objectives of the study. The main objective of the study is to look into the utilisation of the procurement process to enhance health and safety practices. Enhancing health and safety is measured not only in the statistic of accidents but also the cultural change that occurred during then procurement process. This means that the study will look into the actions of the parties during the production process and to record their attitudes, perceptions, recommendations or suggestions pertaining to health and safety. The role of the client, its leadership and the degree of integration of the parties will also be analysed to see if there is any relationship with enhancing health and safety.

The data to be collected will consist of records from documents to show the background of the case. Documents if possible to be photocopied and kept for reference or if not possible, with permission to record by writing. Background of projects/cases: The clients, size of projects, in term of cost, the team involved, clients, architects, engineers, quantity surveyors, project managers and main contractors. Project duration, duration of each production activity e.g. design brief, preparation of contract document, evaluation of tender documents. Procurement route: traditional, design-built or other types of procurement method. The purpose of acquiring these data is to have the right perspective of the individual cases

according to their category. From these data, the uniqueness of each case will be established based on public or private, large or small, procurement methods used. Policies regarding health and safety, engagement of consultants, KPIs, best practice procedures, value for money. These data can be obtained from documentations review. The documentations involved are: name of project, owner, consultants and other relevant info. Contract document to include letter of engagement of consultants, bill of quantities, tendering procedures, per-qualification of contractors and consultants if any. Minutes of meetings are used to review any agenda concerning health and safety and health and safety records from contractors and also consultants. Insurances, compensation schemes, incentives schemes regarding health and safety. The main contributors to these data can be from the clients, public project e.g. local authority or other government bodies. Through clients, it is hoped that cooperation from consultants and contractors could be obtained to access those relevant documents.

This research was designed to analyse the real live implementation of health and safety by all parties in the crucial stages of the production process. Comparisons will be made against recommendations made by the UK government's regarding best practise, policy, existing health and safety regulations, procurement procedure etc. Based on the propositions above, the research aimed at studying the actions taken by all parties at different stages of the production process. It is aimed to highlight the prevailing safety culture in the UK construction industry and this can be a 'benchmark' or reference when studying case studies in Malaysia.

This research used a case study methodology for in depth understanding of how safety practice is addressed in a procurement process. In this research, the case study is also used specifically to verify the propositions described above. As with data collection described above, the information collected through the case study is mainly in the form of qualitative and descriptive data. In this case, all fact findings found during case study process were documented according to safety issues related to the procurement process as well as responses from the key players of construction projects under case study. Data analysis of case study research may occur simultaneously as data collection and analysis can be carried out as an interactive process. The procedures of analysing the result of case study are as follows:

1. All interview results were made in the form of transcript or written reports,
2. All questionnaire feedbacks and fact findings from document searches were recorded,
3. Information and data were then scrutinised and categorised according to safety issues related to stages of procurement process,
4. Information and data were placed into arrays, matrices of categories, and tabulation of frequency of events.
5. Each piece of information and data related to safety issues were then elaborated,
6. Cross case studies were also conducted to measure consistencies of findings.

As major client to the industry, government is well positioned to influence its development. The government, as client can give direct impact on the health, safety and welfare of the workers through its well-formulated policies. The areas where the government, as client can have the greatest impact on health and safety on construction projects are as follows (OGC, 2001):

- The selection of suppliers (including advisers and designers) that have an established corporate commitment and demonstrable performance in respect of health and safety;
- The award to suppliers who have project-specific proposals for managing health & safety that clearly demonstrate a total commitment to zero tolerance;
- The adoption of procurement routes that involve, during the early development and design stages, those parties that will construct, operate, maintain (including) and use of facility; and
- The use of open output performance-based specifications which give relevant weighting to health & safety with other key drivers.

The focus on public project would give the opportunity to study in depth the role of government as client in the procurement process to improve health and safety practices. How the government can enhance health and safety through its procurement policy, what are the relationships between the client and other players in implementing health and safety policies, what is the input that the client needs from all the key players in order to have maximum impact on health and safety are some of the issues to be studied.

Criteria for the case study are public project, live project, and time or activity zone, size of project, public project and number of cases. Public project is to identify the focus on government efforts, roles as leader, client in the procurement process. Analytical study of the initiatives, policies, targets concerning health and safety practices. Influence of client on other players and the players on client regarding health and safety input. Client's perceptions on

health & safety, role, relationship with other players are identified. Live project is about active ongoing projects, where all the players are still available and accessible. It is also possible to look at 'live' activities during procurement process. Feedback from all players during procurement process is more 'real' because of ongoing project. Time or activity zone is to look at the early stages of the project, to highlight the input of parties, upstream rather than downstream or probably up to selection of contractor. The process of choosing consultants by client is to reflect the seriousness of health & safety considering from the beginning. Size of project will help identify the nature of safety practice within companies with different sizes, big versus small to see the difference in attitude, culture, and implementation. The number of cases shows the need a few case studies to be able to 'justify' relevant issues and so that they replicate each other for the purpose of evaluating different situation/size of projects using the same basis for comparison.

5.6 The Case Study Projects

Four case study objects have been selected for this research. These are (i) New Drama Studio, 6th Form Centre and Office Facilities; (ii) Langworthy North Refurbishment, Phase Three; (iii) The Big Mosque of Malaysia; and (iv) District Police Head Quarter, Terengganu. The first two are the UK projects and the remaining two are the Malaysian project. These projects have been selected as case studies to fulfil specific criteria, such procurement system, client, stage of project, and its size for the research strategy. The difference in procurement method is essential to enable an inter-case analysis focusing on the impact of different procurement methods on the implementation of health and safety in the procurement process. The other important issues relating to procurement methods are team integration and leadership,

important drivers for health and safety, which might be affected in the choice of procurement. This section describes briefly each case study object.

Case A: New Drama Studio, 6th Form Centre and Office Facilities, Chester, UK

This project is the construction of a self-contained block to house Drama, Classrooms and Administration Facilities at Helsby High School, Cheshire. These facilities are within the existing school, situated at one end of the existing school building. This project was carried out using a two stage design and build tender procedure. This gives a different type of procurement route compared to the traditional type of tendering process. The main objective of the project is to provide the school with the stated facilities on time to be used for the new school term. The challenge for the contractor therefore is to make sure the facilities are ready on time, and construction stage coincides with the present school term, where the safety of the teachers and students during construction is the main priority.

The client for this project is the Cheshire City Council and the Board of Governors for the Helsby School. Different types of clients will have different impact on health and safety; therefore a selection of different types of client gives a level of diversity for the purpose of inter-case analysis. The difference between clients can be their level of experience related to construction; the structure of their organisation or more obvious difference is between public and private clients.

This is a live project which is very important for pragmatic reasons, e.g. the chance of meeting all the key players for interviews and for 'live' site observations. If possible, analysis

will be made on different 'activity zones' of the project, right from the inception to handing over. This will facilitate the inter-case analysis about the actions, activities of the key players at different stage of the project. The project is considered as small, valued at £ 620k. The duration is 18 months. This will represent 'small' project to enable an inter-case analysis with other selected projects of different sizes.

Case B: Langworthy North Refurbishment, Phase Three, Salford, UK

The project is a refurbishment/renovation of early 20th century terraced housing in private ownership totalling 60 properties. The project is the refurbishment of old terraced houses involving the repair to the external envelope of all the properties and some internal modernization of some of the properties. Total cost of the project is 1.5 million pounds and the duration is 41 weeks. The client is the local city council while the client's agent who undertakes all the procurement process is the architectural and landscape design section of the local council. This section is responsible for the design and tendering process together with a planning supervisor who is in charge of the health and safety requirement of the project. The engineering design is entrusted to the engineering works designer section of the council.

This project is procured by traditional method using the Intermediate Form of Building Contract 1998 Edition. Six (6) contractors submitted their bids for the job and the lowest tendered was selected for the job. The lowest tender cost is about 12 % from the estimate made by the quantity surveyor.

Case C: The Mosque of Malaysia, Kuala Lumpur, Malaysia

This is a prestigious project involving the construction of a mosque with the capacity of 20,000 worshipers in a new township of Putrajaya. This township is designed to cater for all government offices and residential area near the capital of Malaysia, Kuala Lumpur. This project also includes the landscaping job or known as the "Kiblat Walk". The employer is the town council of the new township. The council appointed a Project Manager to act as the client's agent to manage the project.

The cost of the project is in the region of RM 230 million or about 30 million pounds. The duration is 22 months. At the time of this study, the project is just started and the progress is about 6%. This is a traditional type of contract whereby contractors are invited to participate in an open system based on completed bills of quantities prepared by the consultant quantity surveyor. There was also a pre-qualification exercise to selected only qualified contractors to bid for the job.

It is interesting to note that the town council for this project provides its own form of contract with the title of "P.P. J FORM 2000". This is quite unique in Malaysia because normally the usual forms of contract used are those issued by the Public Works Department for government jobs, the PAM form of contract issued by the Board of Architects for private sector jobs or the most recent the CIDB form of contract which is also for government jobs.

Case D: District Police Head Quarter, Terengganu, Malaysia

This project was procured by the government. The client of this project is Ministry of Internal Security. This project consists of the construction of administrative block, workshop, hall, staff-houses, a mosque, and a store. The contract cost is RM 39 million. Project duration is 24 months. Procurement strategy is direct negotiation and using design and build concept. The type of form of contract used is the Design & Build and Turnkey Contract (PWD FORM DB/T).

Table (5.2) Selected Projects as Case Studies

Project	Client	Cost	Duration	Contract Type
Case A: School Extension Chester, UK	Cheshire City Council	£ 620k	18 months	Design-built
Case B: Refurbishment, Phase Three, Salford, UK	Salford City Council	£ 1.5m	10months	Traditional
Case C: The Mosque of Putrajaya Malaysia	Putrajaya City Council	RM 230m (£ 30m)	22 months	Traditional
Case D: District Police Head Quarter, Terengganu, Malaysia	Ministry of Internal Security	RM 39m (£ 7m)	24months	Design-built

5.7 Case Study Protocol

The first step in the case study methodology as suggested by Yin (2003) is the development of the case study protocol. The design of case study requires the formulation of the protocol for data collection to be used in the field procedures. It will also help to reduce missing potential data or information (Yin, 1994). Furthermore, the case study protocol also helps not only to ensure clarity of data investigation procedures but also to improve the reliability of the case study (Stake, 1995).

According to Yin (2003) the content of case study protocol covers procedures, the research questions, analysis and structure of reports. The procedures are field visits, persons to be interviewed and training or interviewers. The research questions will govern theoretical structure and background of study, specific statements of the research agenda and also hypotheses. The analysis will include individual case analysis and cross case analysis. In this research, interview guidelines and questionnaires were developed as a means of the protocol to be implemented. Once the protocol has been established, the research will embark to the actual execution on the field. In this case, the primary activity is data collection using the interview guidelines and questionnaires. In this case, the data collection should be treated as an important issue as Yin (1994) argued that it will enhance the construct internal validity of the study and the external validity and reliability. The following table presents the case study protocol for conducting case studies of investigating how procurement process can improve health and safety practices.

Part	Case Studies Protocol Structure
A	**Introduction to case study** 1. Case study questions and propositions, 2. Case study framework, 3. Case study protocol establishment,
B	**Data collection procedures** 1. Identification and selection of case study objects appropriate for the study objectives, 2. Data collection plan (date to visit, name to interview, documents to collect) including any instruments required such as stationeries and tape recorder,
C	**Case study questions for interview and questionnaire** 1. What safety issues of the project are all about? 2. What is the role of the client relating to health and safety improvement? 3. How procurement process can be used to enhance health and safety practices? 4. How team integration can promote better health and safety practices? 5. What is the opinion of the parties involved in the project regarding current procurement process related to safety matters?
D	**Outline of case study report** 1. Mapping safety activities across the procurement process, including the role of the players, 2. Verification of propositions,

	3. Comparative analysis of the case studies, 4. Quantitative analysis of player's perception on safety improvement, 5. Conclusions from case studies
E	**Case studies analysis** 1. Gap analysis between UK and Malaysia in term of safety practice 2. Procurement process as a tool to enhance health and safety practices, 3. The role of the client to improve the practice of health and safety, 4. Improvement of safety practices through team integration throughout project development process,
F	**Recommendations for further health and safety improvement,** 1. Embedded safety protocol in the procurement process , 2. The client leadership to promote health and safety practices, 3. The need of team integration throughout project development process,

Table 5.2 Case studies protocol design and content

5.8 Data Analysis

In this research, data analysis was conducted to gather insight of procurement process as a tool to enhance health and safety practice, the importance of client's role as well as the extent of team integration throughout in the project development process may help to improve health and safety performance. This research used 4 cases where 2 cases were from UK and the

following 2 were from Malaysia. Each case was analysed individually under the term of intra case analysis and then those cases were analysed under the term of cross case analysis.

5.8.1 Intra Case Analysis

It was decided that data were collected through document search, semi-structured interviews and questionnaires regarding hands on experiences of safety practice under a certain implemented procurement process. The purpose of using multiple data collection techniques (interviews, document analysis and observation) is to gain as much as possible the understanding of the problem in the implementation of health & safety by all parties at specific stages of the procurement process. The outline for collecting the data is important. This is the case study protocol. The research sought to study the actions taken by all parties at specific stages of the procurement process in other to understand their knowledge, perception, cooperation and other relevant issues regarding the implementation of health & safety. These questions deal with existing or real situations and a framework to conduct this investigation is required. The protocol is a document, which provides a theoretical, empirical and practical basis for a successful case study investigation. Yin (1984, 1994) identifies four elements of research in a protocol: design, data collection, analysis and reporting.

Techniques of asking questions can be in the form of structured and semi-structured interviews, informal discussions and written questionnaires. The use of interview technique to elicit knowledge in this research is to obtain primary data regarding the actions, perceptions, and ideas of all parties as described before and also as validation of findings from documents analysis.

There are shortcomings in interviews as Sommer and Sommer (1980) describe that what the people say is not always what they do. The information obtained in interviews is limited to the spoken contact and to inferences made by the interviewer. The data are highly subject to bias introduced by the human interaction of the interview process. While no research method is absolutely free of subjectivity, the interview is more open to bias than most research methods. However, this is not to say that is inevitable.

Careful construction of the questions can help to minimise if not overcome the problem. Triangulation of data also helps to eliminate the shortcomings. By interviewing different personalities on the same topic or question or issue will help in validating it. Interviews can also be validated through documents review and by interviewing different parties. Another method is to use questionnaires to acquire more views from broader audience to validate any issues. Yin (1989) cites that a case study has been defined as trying to illuminate a decision or set of decisions and why they were taken, how they were implemented and with what results.

In this study, their actions, decisions of all parties at the design stage concerning health and safety were scrutinized not only through document review but also by interviewing all the parties involved. This will hopefully give the 'insight' of all the decisions and actions taken. The perceptions, constraints, hopes or dismays of all the parties concerning policies, regulations and all other relevant issues concerning health and safety can be recorded via interviews with the aid of structured, semi-structured or unstructured interviews. Interview questions were based on the following issues:

1. Knowledge concerning health and safety legislation, procedures, best practise, value for money, and KPIs;
2. Team work integration during procurement process, trust, leadership;
3. Procurement perception of procurement in enhancing health and safety, recommendations; and
4. Policy regarding health and safety, priority, best practise, KPIs.

Questions for the interview were designed to be relevant to the research questions and propositions as described earlier. Other references for the interviews were the published government policies, procurement guidance, best practises, and best value for money policy.

The selection of cases or projects was based on the criteria that have been established. These criteria were linked with the questions established based on the literature review, which reflects the objectives of the study. The main objective of the study is to look into the utilisation of the procurement process to enhance health and safety. Enhancing health and safety is measured not only in the statistics of accidents but also the cultural change that occurred during then procurement process. This means that the study looked into the actions of the parties during the procurement process and to record their attitudes, perceptions, recommendations or suggestions pertaining to health and safety. The role of the client, its leadership and the degree of integration of the parties were also analysed to see if there is any relationship with enhancing health and safety.

The purpose of getting this data was to have the right perspective of the individual cases according to their category. From these data, the establishment of uniqueness of each case was based on public or private, large or small, procurement methods used and policies regarding health and safety, engagement of consultants, KPIs, best practice procedures, as well as value for money.

The interview was concerned with client, consultants, contractor and other relevant personnel e.g. lawyers, academics in order to obtain wider view on the subject. A checklist of items/ issues was determined in advance to ensure that the interview is related to the study questions and propositions. The following issues were used as a check list for the interview:

Clients:

1. The role of clients in the procurement process, to find out how much attention has been given to health and safety during selection of consultants and contractors.
2. The clients' perception regarding health and safety, and its relation to productivity and quality.
3. Safety culture in the clients' organisation. Policy, procedures and other measures regarding health and safety.
4. Clients' relationship with other members of the team- cooperation in the early stages regarding health and safety.

Consultants: Architects, engineers, planning supervisor

1. The consideration of health and safety in their design.
2. Their perception, ideas, recommendations, knowledge regarding health and safety.

3. Their role in the procurement process regarding health and safety.
4. Relationship with the client during the procurement process.
5. Safety culture, procedures, policies regarding health and safety in their own organisation.

Questions in the questionnaire as presented in the appendix A were designed to obtain project participants' opinions on the implementation of health and safety in the project being studied. The following statements to be responded by the project participants are included in the questionnaire form and also interview questions lists.

1. The Pre-tender health and safety plan provided by the client has sufficient information for you to prepare for the post contract health and safety plan.
2. Your company's safety record has significant influence on the success of the bidding for this project.
3. All sub-contractors and suppliers are given adequate instructions or information regarding your company's health and safety policy to ensure they understand your company's standing regarding health and safety.
4. If the main contractor is involved in the early stages of design e.g. in design- build contract, then the main contractor can give more significant input in the design in respect to the health and safety.
5. The client's health and safety policy in this project has significant impact on the overall success in term of health and safety of the project.

6. The implementation of health and safety for this project has a significant impact on the overall cost of the project.
7. In the open tender process the contractor is in dilemma to allocate more money for health and safety because this might deprive the chance of winning the tender.
8. In ensuring that the site operators are following all the health and safety regulations, the involvement of the client on site is important, and their regular site visits and has direct communication with the operators will have great impact on their safety behaviours.
9. It is still difficult to ensure every worker on site to follow all safety regulations especially regarding the wearing of safety hat and boots at all time despite their knowledge about the regulations.

The basis of all interviews and questionnaires will be to determine the actions, decisions made by all parties regarding health and safety. The level of achievements, standards will be based on the best practise, value for money and KPIs as set by the government. Questionnaires will be used both for interviews and 'feed-back' type of forms. The questions to be asked will be based on the propositions that have established earlier:

1. Procurement is a stronger driver than legislation to enhance health and safety in the industry.
2. The better the integration of all parties at design stage will result in better cooperation and sharing of knowledge concerning health and safety. This will in turn strengthen the client position to act as an effective leader and strive for the common goal i.e. better health and safety performance.

3. Understanding of best practise will enhance the capabilities of all parties to benchmark each individual achievement and strive for improvement concerning health and safety.
4. Bigger project has better implementation of health and safety requirements because of better budget and team integration at design stage.

Cross questionnaires as presented in the appendix B are intended to be used as the third data gathering tool and also as a triangulation method to further justify the findings from document reviews and interviews as well as questionnaires feedback from the cases. Questionnaires will be given to all parties involved and also others that are considered to have important views regarding health and safety in the industry e.g. lawyers, academics and those in the professional bodies. These questionnaires were designed to gather more views concerning facts gathered via document search and interviews.

Therefore the main tools to be utilised are documents review, interview and questionnaires. Tender and contract documents are important source of projects, they provide:

- Title of project, location, duration, parties involved, cost and method of procurement
- Bills of quantities: to allocate sum, provision for health and safety, specification
- Terms of contract between client and consultants, between client and contractor focusing on health and safety
- Pre-qualification, if any, any emphasis on health and safety

- Written policy, procedure or practise regarding health and safety by all parties involved
- Records concerning health and safety for the project and contractor
  - Minutes of meetings: monthly or site meetings to see any actions, cases concerning health and safety
  - Training, courses relating to health and safety
  - Safety file as required by CDM

5.8.2 Cross Case Analysis: Four Case Studies

Cross case analysis was carried out to compare findings of the 4 case studies conducted in the UK and Malaysia. It was simply undertaken by a comparative analysis of data and information gathered during case studies on the field. The comparative analysis was to obtain any gap of the implementation of health and safety across the procurement process studied. This may help understanding the differences and similarities of safety practices found in the UK and Malaysia cases. The first thing to compare is the project participants' concern of safety. This will show how different of the players' perceptions on safety and health related issues between both countries. The second comparative analysis was to show established propositions in the UK and Malaysia. The third described a comparative analysis of safety concern made by the different players from both countries. The cross case analysis would also find the significant different of safety and health implementation as well as how they use procurement procedures to control the implementation of health and safety practice. In this analysis, the different commitment and roles among the project team to improve health and safety were also discussed. The issues of how to change health and safety practices were also

compared. The final analysis showed factors affecting health and safety as perceived by project participants from both countries as well as the extent to which procurement process can be used to introduce better health and safety practices. This analysis may help understand the difference of both countries' achievement in term of safety and health practices.

5.9 Summary & Conclusion

In this research, the case study methodology was selected to unveil in depth understanding of how procurement system can enhance safety practice in construction. For the sake of the theory building, three propositions were established. The first proposition is that the greater the involvement of client, both in the public and private sectors, in the earlier stages of the procurement process, the more impact they will give in enhancing health and safety. The second proposition is that procurement is a stronger driver than legislation to enhance health and safety in the industry. This second proposition shows that clients with better leadership quality would result in better management of the health and safety. The third proposition is that the greater the degree of team integration the better will be the health and safety performance.

Those three propositions were verified through the case study of four different projects in the UK and Malaysia. These case study objects were procured by the government and private sector using different procurement systems. In this case study, data collection was carried out using structured interview, questionnaire, and documents search. The interview was carried out to identify key project players' involvement and integration including client's involvement in addressing safety issues across the project development stages. The

questionnaire was also used to obtain evidence of how safety issues are put on board during the project development process. The document search was also carried out to complete facts finding of interview and questionnaire. This may assist to analyse whether safety and health issues are addressed well.

CHAPTER 6: CASE STUDY REPORT

6.1 Introduction

This chapter reports the findings of the case study. In this chapter, safety issues related to the procurement of four construction projects in the UK and Malaysia are addressed. Evidence of how safety issues were incorporated into procurement systems of those projects is discussed. This may assist in understanding the commitments of project participants in enhancing safety culture and practice. Due to different project sizes and procurement systems of the projects under study, inter and intra cases analysis were also undertaken. This chapter also highlights verification of propositions established in this research. Further discussions of findings of the case study are concerned with client leadership in improving safety and team integration required to working well together in enhancing safety culture and practice. Finally, lessons learned from the case study are presented for further recommendations.

This section summarises results of interviews and discussions with key project participants. The interviews and discussions are concerned with client's safety policy in general, safety issues in pre-qualification of contractors, tender documents related to safety matters, safety and health criteria for design, safety records of contractors participated in the tender, sub-contracting requirements of safety, safety audit, accident reporting systems, integration of safety into project planning and design, and safety committee and meeting. This case study reports every stage of project development in order to trace safety activities from the inception stage. In this case, client's role and policy on safety were necessarily investigated. Client's policy deals with any written policy regarding health and safety and how the setting

up of safety occurred in the client's organization as well as person in charge of health and safety including his or her qualification.

The case study also identify and then reports safety practices and to gain an insight of safety activities from the beginning of project procurement process. It started by looking at the client's role, such as client's policy on any written policy regarding health and safety and set it up in the client's organization, as well as anybody in charge for health and safety and his or her qualification required. The study then traced the choice of consultants in term of the choice of project manager, criteria of choosing the project manager, any selection requirement on consideration of health and safety and any contracts regarding health & safety issues included. The tendering process was also studied, particularly the choice of procurement method, whether the client or client's agent also considers safety rather than just cost and time as well as how their perception about the relationship of safety and quality and productivity.

The case study also dealt with architects' concern of safety and other consultants' standing on health & safety, any policy they have or because the client imposes safety. Other issues are the documentation prepared by the quantity surveyors, how much input regarding health & safety given by the clients during design stage, and whether the architects consider health & safety in the design. A query of whether the consultants really look at the method statement by contractor before work start on site was also carried out. The contractor's attempts to incorporate safety matters in the construction planning and method of statement were also studied, such as any allocation for safety expenses when estimating for the job. The study also looked at work on site and discussed the day to day management by contractors, the

agreement between contractor and sub-contractors on the contract concerning health & safety, including site meeting.

6.2 Case Study No.1 – Helsby High School Drama and 6th Form Block, Cheshire, England

This project is the construction of a new block to house drama, classrooms and administration facilities within an existing school area. The budget for this project is 620 thousand pounds sterling (RM 4.2 million) which is partially funded by the local authority and partially by the school authority with the construction duration of 13 months. The client is the Cheshire City Council together with the Board of Governors for the school. The City Council is responsible for all the technicalities and running of the project while the school Board of Governors, the end user, particularly the Head acts on behalf of the Council to be directly involved with the consultants in the construction process.

A two-stage tendering procedure was adopted for this project. The first stage is to call for design proposals by selected or pre-qualified contractors by the Council. In the second stage, the selected contractor is given the task to fully design and build the project together with the contractor's appointed consultants. The form of contract for this project is the Standard Form of Contract with Contractor's Design 1998 Edition.

Mapping Safety Activities

In this case the researcher started the study when the project was just started and in the third week after possession of the site. Therefore the opportunity to meet the key participants during the monthly site meetings made it possible to solicit important information regarding safety issue in this case. Interviews were conducted mostly in the offices of the key participants i.e. the local authority, the agent, the architect, the engineer and the contractor. Informal discussions were also made after site meetings and interviews with the site supervisor and the school authority during site visits give important 'real-life' happenings regarding the issue of site safety in this project. Reports on site meetings were also made available and site observations concerning safety on site were made regularly.

The Client's Role

The client has an important role in the overall success of a project. After all, the client is the one who finance a project and has the greatest interest to see that a project is completed successfully. In this case the client for the project is the Cheshire City Council and the School Board. The needs in term of space and functions were determined by the School and the Council is responsible for all the implementation of the project. The client has the greatest opportunity to interact with the consultants in the early stages and can be influential in ensuring all the parties have taken all necessary steps regarding health and safety in the design (Jeffrey and Douglas 1994).

In this case, the client has appointed an agent who is responsible for all the work right from the beginning, i.e. design, selection of contractor and day to day running of the project. When

asked about the client's role in health and safety it is quite obvious that actually the agent is the one who is entrusted to ensure that the issue of health and safety has been taken care of. The Council has a standard policy about health and safety. The obvious policy is that all contractors registered with the Council must have good safety record and these record are been checked from time to time.

Referring to the HSE (HSE 2002) clients have a pivotal role in setting and achieving high standards in health and safety because:

- They can set the tone for the projects
- Have overall control of how contracts are set up and how the work is done
- Make crucial decisions e.g. budget and time for projects; and
- Select the designers, contractors, etc who carry out the work and decide the timing of their appointments determining whether they can work effectively as a team

Does the client have the required knowledge regarding health and safety to really give a significant impact for the team or project? In this case, the 'real' client i.e. the Council, according to the architect, has no real role to play. For the client's agent, when asked about the contributions from client, he cited some input from the school board, the end user but not much. The client's agent on the other hand regards himself as the party totally responsible to ensure all parties play their part regarding safety. The client's agent and the architect both agreed that the client, the Council and the School have low technical knowledge about safety. The school gave some input to ensure that the students are safe and also a little about finishing materials for the floor to be considered. In this case since an agent has been appointed by the

Council, the function of the client has been assumed by the agent and in this report, where the word 'client' is used it is more logical to refer to the agent.

Appointment of Agent

The client uses an agent to run the project and aspects relating to safety issue, it is important to choose a competent agent to ensure that the project is done according to health and safety regulations. Referring to CDM Regulations executed under Clause 4 (2) which stipulates that:

> *' no client shall appoint any person as his agent under paragraph 1 unless the client is reasonably satisfied that the person he intends to appoint as his agent has the competence to perform the duties imposed on a client by these Regulations.'*

In this case, the employer's agent is a quantity surveying consultant which has been doing a lot of projects with the local authority. When the issue of competency is brought out, the client explains that the appointment of this consultant to be the employer's agent is totally based on the excellent track record and long-term partnership over the years. The confidence of the client with the consultant can be seen when the agent remarked that he was offered the job *'...just over a phone call'*.

In an interview with the local council, although the job is small but due to the cost and time constraints, an agent with a proven track record is needed to ensure the overall success of the project. In term of safety, it is a policy of the local authority to ensure all projects are done according to the requirements of the CDM and the employer has full confident in the agent's

success record to ensure all other consultants and contractor abide with the existing regulations.

According to the employer's agent at the conceptual and feasibility stage, he was not worried about the safety issue because the job is small. When asked whether the time and budget for this project have any impact on safety standards, the architect who works for the contractor says that if the work is not in accordance to the schedule it is possible to have some impact but budget is not a major problem.

Regarding the role of client, in this case the City Council, at the early stages, when asked about any specific instruction about safety, the agent explained that although there are no specific instructions relating to safety regarding this project, it is understood that all the team members must understand their roles in safety issues.

Choice of Contractors

The choice of contractors to bid in the first phase of the tendering process (three in numbers) was made by the Council who had a list of "pre-qualified" contractors. An important criterion for the prequalification exercise is the health and safety record of the contractors. According to the local council, all contractors have to fill in a form to certify their safety records. In the form, the contractors have to submit their companies' health and safety policy, certified health and safety records of previous projects, particulars of personnel in-charge of health and safety i.e. any safety officers or planning supervisors in their organizations.

The local council in this case voice out their satisfaction with the current health and safety procedure in their organization and from time to time discussions, reviews are made to improve the existing procedures. In one of their meetings they discussed of an issue, "Vetting consultants for health and safety competence with CDM Regulations", they have decided that any consultant appointed to their Approval Panel should complete the Competence and Resources Questionnaire. This shows that there is a mechanism of vetting consultants regarding health and safety issue and in this case presumably the consultant chosen is well known by the client and there is no doubt about their capability in handling the job without jeopardizing health and safety.

In the selection of contractors in the first phase, the agent had no involvement at all and the names of the three contractors were given to the agent by the local authority. When asked the question about the safety records of the contractors, the agent pointed out that it is the decision of the client and they knew that the contractors or recommended tender participants are listed and have been pre qualified and the agent has no doubt about their positive health and safety record.

Selecting Procurement Strategy

A procurement strategy was also introduced in this project. The employer's agent used a two stage design and build tender procedure. The selection of the contractor was done in two stages. In the first stage, pre-qualified contractors were invited to tender. The contractors submitted their proposals based on the Employer's Requirements document which covers general narrative on the accommodation required, specification of materials and

workmanship, information on planning constraints, proposed form of building contract and an indicative cost plan of the scope of work.

In the second stage, an open book negotiation was carried out with the selected contractor from the first stage tender. The contractor selected his own design team to develop the detailed design together with inputs from the school authority and the employer's agent. The contractor was also responsible to invite tenders from selected domestic subcontractors.

In the first stage, a limited number of contractors, in this case, three contractors were invited to submit proposals based on the employer's requirements but the price must not exceed a stated amount. At this stage the contractors were also required to submit details of programme, method statement, proposed site personnel, design consultants and specific pricing information to be used in the second stage should they are successful.

The second stage was conducted through an 'open book' negotiation with the selected contractor to produce a fixed contract sum against a specific scope of work. The detailed design was developed by the contractor's design team in discussion with the client's agent and the school. The contractor was responsible for the selection of sub-contractors based on the developed detailed design.

The rationale of using this two stage design and build tender procedure was given in a document called 'Proposed Procurement Strategy' prepared by the client's agent and given to the Helsby High school Board of Governors for their approval. The followings were the

expected benefits stated by the agent to the client by using the two –stage of design and build tender process:

- The selection of a suitable design and build Contractor in competition,
- A single point of responsibility for both detailed design and construction,
- Ability to submit full planning drawings before a contract price is agreed,
- The comfort of having a binding 'not to exceed' price at early stage,
- A method of detailed design was developed by the Contractor in conjunction with Helsby High School allowing flexibility in influence design
- Ability of client to vary or instruct additional works with the prior knowledge of exact scope of work forming the contract sum,
- Selection of specialist subcontractors in competition against a specific scope of work,
- The opportunity of developing a non-adversarial relationship with a contractor prior to commencement of construction on site,
- The appointment of a Contractor who takes the risk for design and construction, reducing the possibilities for variations and claims.

As with the procurement strategy, the client's agent believed that this type of procurement strategy could provide the client a building work that is the responsibility of one contractor, is of known quality, competitively priced and pre-planned in terms of personnel and programme and collectively should reduce the client exposure to risk.

The two-stage tendering procedure adopted in this case complies with one of the principles laid down by the Government Procurement Guidance No 10, Achieving Health and Safety

(OGC 2001) which states that at an early stage, an integrated supply team ensures that the design and construction aspects are properly considered before construction starts. The contractor and his designers was selected after the first stage and in the second stage, they have the opportunity to work as a team to develop the detailed design together with the client. The client's agent strongly agreed that the two-stage tendering procedure is very successful in working as a team right from the early stages and greatly enhances the success of the project and he considered that the project has been one of the smoothest running projects he had been involved with.

Appointment of Safety Supervisors

In the early stage of the project the appointment of the Planning Supervisor is an important requirement by the CDM Regulations. The Planning Supervisor is termed as 'a creature of the regulations' (Summerhayes, 1999) and he stated "...that the function of Planning Supervisor is to facilitate and coordinate the health and safety management process with particular emphasis on the design and planning phases and it does not translate into that of being the: technical auditor or the safety advisor."

Once the contract has been awarded, the main contractor must provide a Planning Supervisor to be in charge of the project. In this case the contractor has an in-house Planning Supervisor. It is important to note that before the construction phase can start, the Planning Supervisor on behalf of the main contractor must submit for approval by the agent's Planning Supervisor a health and safety plan for the construction phase.

Preparation and Submission of Safety Plan

In this case, the Health and Safety Plan was divided into two stages: the Pre-Tender Stage and the Design Construction Stage. In the Pre-Tender stage, the client's agent prepared the Pre-Tender Health and Safety Plan. The Planning Supervisor in this case comes from the client's agent organization. In this document all the requirements relating to health and safety in the project was issued by the Planning Supervisor to help the tender participants to prepare a quotation or tender considering all the health and safety requirements. The Planning Supervisor comes from the agent's office and has a tremendous experience relating to health and safety. Looking at the Pre Tender Stage Health and Safety Plan, it is very detail covering the existing environment, the nature of the works, construction hazards, maintenance hazards, construction methods, materials, facilities to be provided on site and emergency procedures.

Commenting on the above Pre-Tender Health and Safety Plan, the designers i.e. the architect and structural engineers agreed that it is very useful in 'gauging' the extent of hazard the particular project. The designers together with the contractor worked together to prepare the risk assessment of the project. The contractor's quantity surveyor confirmed that the risk assessment is important factor and does affect the overall of the project. But according to the contractor this project is considered 'small' and the cost allocation for the health and safety is not so significant.

The architect on behalf of the contractor prepared the "Risk Assessment Record" or the method statement which is part of the Health and Safety Plan-Construction Phase as required

by the client. The contractor is responsible to submit the Health and Safety Plan and obtains the approval from the client's Planning Supervisor before work commences on site.

According to the requirement as stated in the CDM regulation, the Construction Phase Health and Safety Plan must be approved by the planning supervisor at least 14 days prior to the commencement of work on site. This is an important aspect of the CDM regulation in assuring that all parties have taken seriously the issue of site safety before the work starts. It is required for the contractor to give a 48 hour prior notice before work starts but this project has been started without the 48 hour notice to the client and this was notified by the architect on behalf of the contractor, expressing their regret on this matter via a fax to the school authority.

Safety Policy/ Contract between Main Contractor and Sub-Contractor

The main contractor's safety policy is another interesting aspect of ensuring that all subcontractors for this job have been scrutinized regarding their safety record. This is in accordance to the CDM Regulations which state that,

> *' No person shall arrange for a contractor to carry out or manage construction work unless he is reasonably satisfied that the contractor has the competence to carry out, or as the case may be, manage , that construction work.'*

The main contractor in this case, did the assessment of the sub-contractors regarding the health and safety by requiring them to submit their safety policy and also a completed 'Contractors Appraisal Questionnaire'.

Among the rules given by the main contractor to the subcontractors involved in this project as stated in the document called 'Safety Requirements for all Sub-Contractors', is the requirement for the sub-contractor to provide a method statement describing fully describing the working procedures and need to be approved by the main contractor before work commences on site.

There is a bold note for the sub-contractors warning about the usage of safety helmets and appropriate protective equipment for the job and it says,

> *' Any sub-contractors employee failing to observe this rule will be asked to leave the site and will only be allowed to continue working once properly attired. Any such incidents will be noted for your post-contract appraisal score and may affect your chances of obtaining further work from the main contractor.'*

In the contractor's appraisal questionnaire prepared by the main contractor some of the questions were:

- Do you have a Company Safety Policy?
- Who is responsible within the company for health and safety?
- What health and safety training has this individual received?
- Who is the professional safety officer/consultant for the company?
- Who is responsible for monitoring health and safety within the company?
- Is there any safety manual within the company outlining rules and working procedures?
- What health and safety training do you provide?

Besides those details, the sub-contractors have to give the details of the company's record for the past two years and this includes all reportable accidents.

Employment of Independent Health and Safety Consultant

Besides the involvement of planning supervisors from both sides i.e. the client's side during the pre-tender stage and also the contractor's side after the tender stage and during construction, the contractor has also employed an independent health and safety consultant to verify that the work has been done accordingly and a written report was given after each visit. The report was given to the main contractor and was discussed at site meetings. Examples of comments by the independent planning supervisor in his report were as follows:

- Plant was found running whilst unattended, ensure plant is not left running to prevent unauthorized use,
- There are loading bay gates missing from both loading bays, these need to be in situ prior to the scaffold being put into further use,
- Bricks guards need to be put in place throughout the scaffold to prevent materials falling.

The site supervisor has a tough job of getting the workers to wear their protective gears. According to him there were several occasions whereby some workers did not wear their safety helmets and he had to warn them. When interviewed, the workers responded that sometimes they feel that the helmet is not necessary and they just do not like to wear it.

Site Safety Activities

The frequency of visits by the private planning supervisor in this case is once a month. There is also a weekly checklist for health and safety prepared by the contractor and the checking is being done by the site supervisor who is always at the site. The report concerning the checklist is presented in the monthly site meetings. The site supervisor is the person responsible to ensure all the workers on site to abide with all the rules and regulations.

Besides the weekly checklist, the health inspector from the Health and Safety Executive (HSE) came to have a site inspection. The members of team were told about the health inspector's intention during the site meeting.

In the site meetings there is one agenda for health and safety report. The report is tabled by the contractor and any issue about site safety is discussed in the meeting.

There was an instant where it was reported that the students have been throwing snowballs at the site workers and in the meeting the school representative take a note of it and promise to make a special announcement to the whole school about the danger of the construction site and it is out of bound. The site risk assessments and method statements were also discussed when required.

The site agent agreed that the two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from

all parties early in the design stage. Finally the site agent strongly agreed that the freedom of choice of consultants by the main contractor makes it easier to work as a team in this project.

6.3 Case Study No.2 – Langworthy North – Refurbishment/Renovation of Terraced House- UK

The project is the refurbishment of old terraced houses involving the repair to the external envelope of all the properties and some internal modernization of some of the properties. Total cost of the project is 1.5 million pounds and the duration is 41 weeks. The client is the local City Council while the client's agent who undertakes all the procurement process is the Architectural and Landscape Design Section of the Local Council. This section is responsible for the design and tendering process together with a planning supervisor who is charge of the health and safety requirement of the project. The engineering design is entrusted to the engineering works designer section of the Council. This project was procured by the traditional method using the Intermediate Form of Building Contract 1998 Edition.

Mapping Safety Activities

The method of collecting data for this project was done similar to the method done for the UK case studies. Interview with key players, document search and site visits were the method used in this case. The first concern of this case study is to identify general information related to safety and health practices undertaken. Respondents from the main contractor, project management consultants, quantity surveyor, contractor project manager and contractor's

safety officer were interviewed in order to get insight how the project is run subject to safety and health issues.

Client's Input

The Client for this project is the City Council. The Architectural and Landscape Design Section is the technical department which house the professionals. It is a department by itself and the office is situated away from the City Council main office. The architect, engineer and the quantity surveyors work in the same department.

The City Council has an established Health and Safety policy and for this particular case, the relevant code of practice issued to the contractor is the Part 1 of code of Practice (K) which is part of the council's health and safety policy arrangement. This code of practice concerns maintenance work.

The fact that this case involves maintenance of terraced housing with occupants, the essence of this code of practice is to ensure the safety of the occupants and by-passers. As the Principal Client, the City Council although has established a known health and safety policy, all the relevant work to ensure the project runs safely is entrusted to their agent, i.e. the Design Division of the council. According to the architect of this project, the client has no direct involvement regarding health and safety, and when asked about the role of the client in ensuring all parties are serious in implementing health and safety in the project, he pointed out that the City Council owns the safety policy but they did not have direct role to play. The group leader for this project, who is also an architect, was unsure and he stated that the clients

are not technically aware and they see that health and safety as the design team or the contractor's responsibility. In contrary, the quantity surveyor and the private planning supervisor for this project stated that the client has great influence in the health and safety issue for this project. The role of the client in this case is played by The Architectural and Landscape Design Section and for the contractors they are the client. Therefore when the quantity surveyor and the planning supervisor commented about the importance of the client's role, they meant the technical section of the Council which includes all the professionals.

Procurement Strategy

This is a traditional form of contract where all the design has been ready before tendering process. This project was procured by the traditional method using the Intermediate Form of Building Contract 1998 Edition. Six (6) contractors bid for the job and the lowest tender participant was selected for the job.

In the tendering process, the items concerning health and safety given to the prospective tender participants were the Council Health and Safety Policy, Code of Practice K, and Building Maintenance Works. These are a pack of documents detailing all the requirements, procedures, methods of working, safety checklist, and the essence of this document is to ensure the safety of the public during the refurbishment activities.

Regarding health and safety questionnaire, the contractors had to complete a series of questionnaires regarding their health and safety policy and also their health and safety record. An interesting foreword in the form is the statement by the city council. The award of the

contract was therefore determined not only on grounds of price and technical ability, but also on the past safety record and present ability to carry out work safely and without risk to health. The contractor was required to name person or persons responsible for health and safety, training, and their safety record in the past three years. Another important question in the form is how the main contractor assesses the health and safety records and competence of sub-contractors and suppliers and designers with whom the contractor has contracts.

The chief quantity surveyor for this project slightly agreed that the safety record of the contractor has only small significant in the selection process because only contractors listed with the Council were invited to tender for the job and they have been assessed on their safety records. But according to him even if a contractor is on the approved list he can still be stopped from tendering if his health and safety record is poor. In this case the increase in the recorded accidents is not significant enough to penalize the contractor. It seems that the increase in the number of accidents does not have significant impact on the choice of this contractor. Looking at the safety record submitted by the contractor, the number of reportable accidents has increased from 13 to 19 and number of recorded major injuries from 1 to 4. The accidents rate per 1000 employees rose from 7.4 to 23.5 in the last two years.

The same quantity surveyor disagreed that the lower cost submitted by the contractor compared with the client's estimate means that there is a possibility that the standard of health and safety for this project is lower than required. According to him, the health and safety requirements were well spelt out in the tender documents and the contractor is aware of his responsibility and the cost submitted by the contractor has taken this into consideration.

The private safety officer for this project strongly agreed that the safety record has little impact on the selection process and contrary to the statement by the client's quantity surveyor, but the safety officer strongly agreed that if the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.

In one of the site visits with the safety officer who acts on behalf of the client, he had to stop the work of one of the sub-contractors on site due to inadequate safety precautions taken and he was also not happy with some of the scaffoldings. According to him, the standard of safety is still not that satisfactory and blames the main contractor and this is the reason he pointed out that he thinks that not enough allocation has been given to this job regarding health and safety by the main contractor.

Preparation of Safety Plan

The Safety Plan was also discussed. The Pre-Tender Health and Safety Plan was prepared by the client's planning supervisor and is meant to give the contractor the extent of health and safety measures required in the contract for the job in ensuring the health and safety of all workers and public on site. All the respondents in this case agreed and some strongly agreed that the preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they form a good basis for the contractor to price the job without compromising on health and safety. And according to the contractor, the pre-tender

health and safety plan provided by the client has sufficient information to prepare the post contract health and safety plan.

Since the project involved asbestos, Code of Practice (A) Asbestos was also considered. The project involves old terraced houses and the specific inclusion of this code of practice shows the possibility of dealing with materials containing asbestos. This code of practice contains a model for safe systems of work when dealing with asbestos.

The contractor is required to name person or persons responsible for health and safety, training, and their safety record in the past three years. Another important question in the form is how the main contractor assess the health and safety records and competence of sub-contractors and suppliers and designers whom the contractor has contracts.

In the bills of quantities in this project, there was a specific item for health and safety to be priced by the contractor. In the Bill No.2-entitlled Health and Safety in the general requirements section it is specified that, *the whole of the Health and Safety Bill shall be adequately and fully priced, with each item priced separately*...but it is noticed that the whole section of this bill was not priced and in again in the tender summary, the health and safety section was not priced.

According to the quantity surveyor this is a common practice by contractors i.e. not to price this item. According to him, the overall price for safety items has been taken into consideration when pricing all the other items and the contractor is confident that his price is

adequate to provide the safety requirements. When asked is it because the additional cost for safety will affect his chances to win the tender, he said yes, this can be another reason.

The main contractor's safety officer agreed that the implementation of health and safety for this project has a significant impact on the overall cost of the project and she slightly agreed and when asked whether in this open tendering method the contractor is in dilemma to allocate more money for health and safety because this might jeopardize the chance of winning the tender, she also agreed.

The Safety Plan

The Pre-Tender Health and Safety Plan – this was prepared by the client's planning supervisor and is meant to give the contractor the extent of health and safety measures required in the contract for the job in ensuring the health and safety of all workers and public on site. All the respondents in this case agreed and some strongly agreed that the preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they form a good basis for the contractor to price the job without compromising on health and safety. And according to the contractor, the pre-tender health and safety plan provided by the client has sufficient information to prepare the post contract health and safety plan.

There is no input from the contractor in the pre-tender health and safety plan because this is a traditional contract and all the design has been completed by the client technical department.

The contractor had to send a pre-construction safety-plan before any work started and was done without any problem.

Planning Supervisors

The client has his own Planning Supervisor to take care of the safety issue of the project. Besides issuing the Pre-Tender Safety Plan he is the one who makes sure that the Pre-Construction Safety Plan submitted by contractor is up to standard. The Client also employs an independent Safety Officer to check and supervise the project.

Safety Policy/ Contract between Main Contractor and Sub-Contractor

It is in the Health and Safety policy of the City Council to register contractors with proven record and an important question in the form is how the main contractor assesses the health and safety records and competence of sub-contractors and suppliers and designers with whom the contractor has contracts. All the contractors tendering for this project are registered and according to the quantity surveyor the technical department is confident that the main contractors have their own policy regarding sub-contractors in the safety issue.

Comparative Study of the UK Cases

The UK case studies are both considered to be small projects. The school is about 600,000 Pounds and the renovation work is 1.5 million Pounds. The main different is the type of procurement strategy adopted for the project. The school uses design-build and the renovation work uses the traditional tendering procedure using bills of quantities.

Client's Role

Case 1:

The client per se is the appointed agent who happens to be a quantity surveying firm who has a very good record with the council. Another 'client' is the end user, i.e. the school board which is more 'active' then the council in giving a minimal but relevant input that has some significant impact on design both at the design stage and also during construction. The school board was regular during site meetings and shows their concern about the safety of the students during construction. Overall the team is satisfied with client's agent in controlling the team to implement the project safely. The agent is happy with the team and he considered this is one of the smoothest jobs he has experienced.

Case 2:

The client is the city council and the technical department takes responsibility of the production process of the work. In this department all the technical staff i.e. the architect, engineer and the quantity surveyor work together and they agreed that all consultants working in one place has its advantages. The production process of the documents becomes easier and in this case they were satisfied with the documents given to bidders in relating to safety issue. The city council did not have has much input regarding health and safety for the designers and their only contribution was the provision of the list of pre-qualified contractors registered with the council to the technical section for their tendering process.

Again, the question of the selected bidder who has an unsatisfactory safety record makes the function of the council regarding safety policy questionable. The technical section has no

problem in ensuring the contractor abides by safety regulation and has employed an independent safety officer to ensure all parties play their role regarding site safety.

Procurement Strategy

Case 1:

The two-stage tendering procedure adopted by the school is successful and all the key players voice out their satisfaction regarding the procurement strategy. They agreed that with design-build contract the contractor comes into the picture at the early stages. This is a small project therefore the significant of the input by contractor at the early stages is not obvious although all agreed that it is a good opportunity to do so.

The pre-tender safety-plan given by the client to all bidders in the first stage is good enough to highlight of risk to be considered by the bidders. This has been verified by the selected contractor that he satisfied that all information has been given relating safety issue.

Case 2:

This is a traditional contract and a list of registered contractors bid for the project. It is an open tender and the lowest bidder was selected. His price is about 12 % lower than the quantity surveyor's estimate. It is a bit odd that the safety record of this contractor is not encouraging but still he was awarded. The quantity surveyor was fully aware of this situation but it did not disqualify the bidder. The drawings and specifications are completed before tender process and the contractor agreed that enough information was given to evaluate the safety factor of the project.

Team Integration

Case 1:

The client and designers had the opportunity at the pre-construction stage to work together in preparing the pre-construction safety plan. The selected contractor had the opportunity to get feed-back from client and designers early in the design stage because the design was not completed and all the team members can work together to produce design within budget and time frame and taking construction safety in consideration.

Case 2:

Although the client's quantity surveyor insisted that the lowest price quoted by the selected contractor will not jeopardise safety standard, the independent safety officer was sceptical about this statement. He agreed that it is beneficial in relation to safety if the contractor was given a change to give input during design stage.

Quantitative survey among key players in the UK cases

The project participants were then asked to provide their opinion rating on who is the most influential participant toward the implementation of health and safety as given in Figure 6.1 and Table 6.1. Findings unveil that planning supervisor and contract manager are two influential participants to drive the implementation of health and safety. In fact, the client and the client's agent have not been recognised as a project participant who can also influence to deliver the best practice for health and safety in construction. The client can help to provide a clear objectives, safety policy and direction on how all project participants working together

controlling any undermining health and safety by avoiding, reducing and eliminating occurrence of those factors.

It has been widely discussed that factors affecting health and safety on site are not only associated with management failures on the contractor organisation but also upstream boundary of organisation of construction work (Whittington et al, 1996). However, this case study found that most issues related to construction safety and health is still considered as a matter of production process.

Looking further at how activities by project participants can help to improve the implementation of health and safety in construction project, the case study in UK found that most of them believed that many activities are helpful. Figure 6.1 describes that activities that help in the successful implementation of health and safety for the project are varies according to the perceptions of project participants. The quantity surveyors of UK believed that client's brief and specification, preparation of pre tender health and safety plan, and involvement of site supervisor on site supervision are among activities which are higher rate to assist the successful of health and safety implementation. However, planning supervisors and client's agent did not reckon client's brief and specification and input by client during construction may help a lot for the health and safety implementation. To the contrast, quantity surveyor of contractors has argued that those activities listed can help to the successful of health and safety implementation.

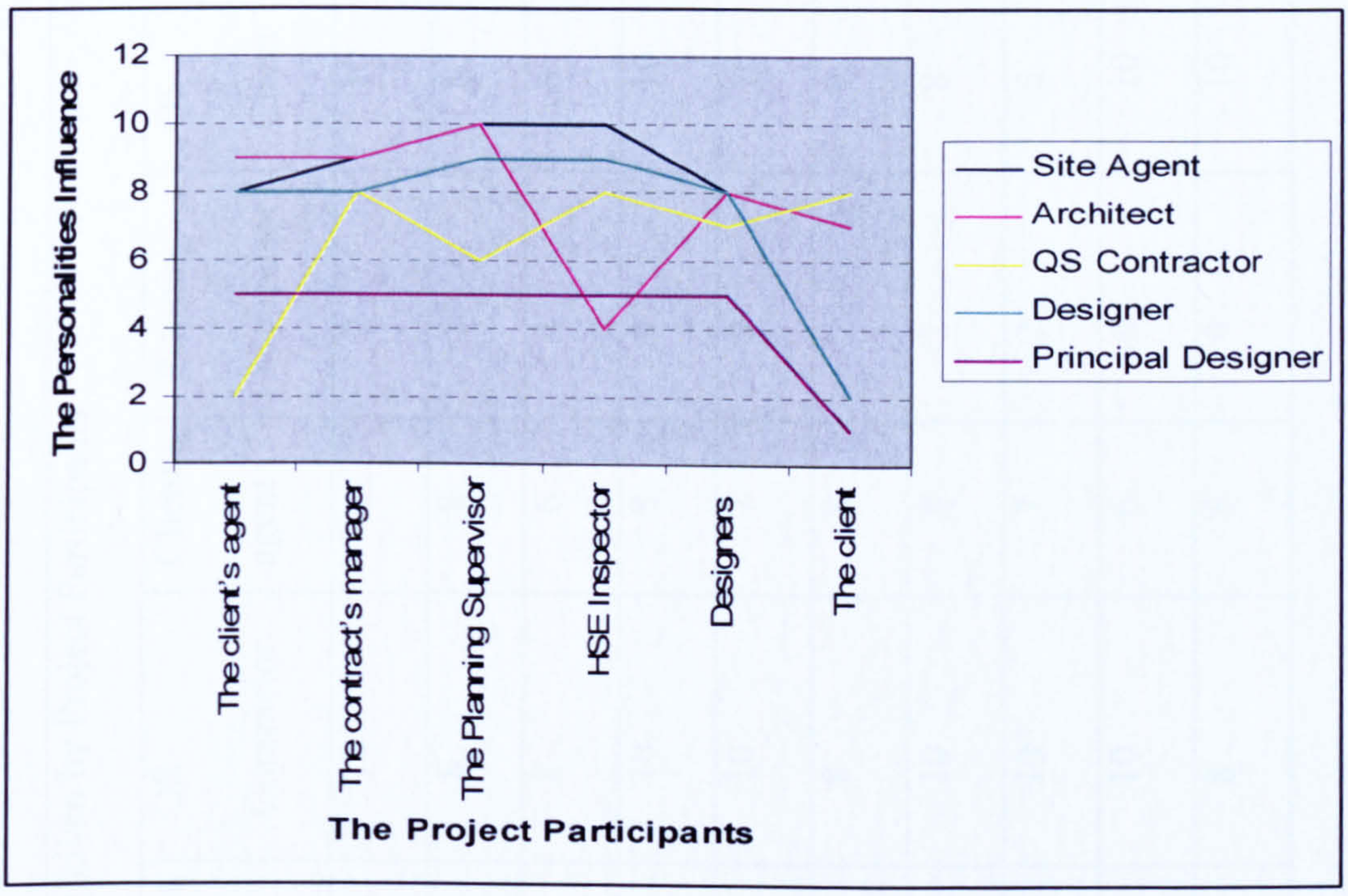

Figure 6.1 Project Participant' personalities influence

Personalities of project participants may influence the implementation of health and safety on site. Figure 6.1 shows personality's influence of project participants based on project participants' view. The fact that designers and principal designers believed that client's personality does not really influence health and safety. The clients might be regarded far away from safety matters of procurement process rather than planning supervisor and HSE Inspector as viewed by site agents. However, architects, designers and site agents agreed that client's agents and contractor's manager have more influential role in delivering health and safety implementation throughout procurement process.

Table 6.1 Response of British Project Participants on the activities that help in the implementation of H&S

No.	The activities that help in the successful implementation of health and safety for the project	Rating given by Project Participants					
		Architect	QS Contractor	Client's agent	Planning Supervisor	QS Client	Total
01	Client' brief or client's specification	8	10	2	2	10	32
02	Selection of main contractor	8	8	8	4	8	36
03	Type of procurement strategy	7	8	6	4	5	30
04	Preparation of pre-tender health and safety plan	10	10	8	9	10	47
05	Method statement by main contractor	8	10	7	9	10	44
06	Selection of consultants by contractor	9	8	8	7	9	41
07	Selection of sub-contractors and suppliers	9	10	8	7	8	42
08	Input by client during construction	10	10	7	2	5	34
09	Daily and weekly H & S report by site supervisor	8	10	6	8	10	42
10	Inspection by HSE Authority	5	8	5	9	10	37

Leadership qualities for health & safety concerns were also regarded by project participants as an important trigger for the successful implementation of health and safety. Figure 6.2 and Table 6.2 show leadership quality rated by project participants to assist in the implementation of health and safety. However, quantity surveyor both in client's side and contractor's side view that risk tolerant, motivator and failure tolerant are leadership factors which less affected the health and safety. Planning supervisor also tends to see that enthusiast and motivator, failure tolerant do not assist a lot for health and safety implementation.

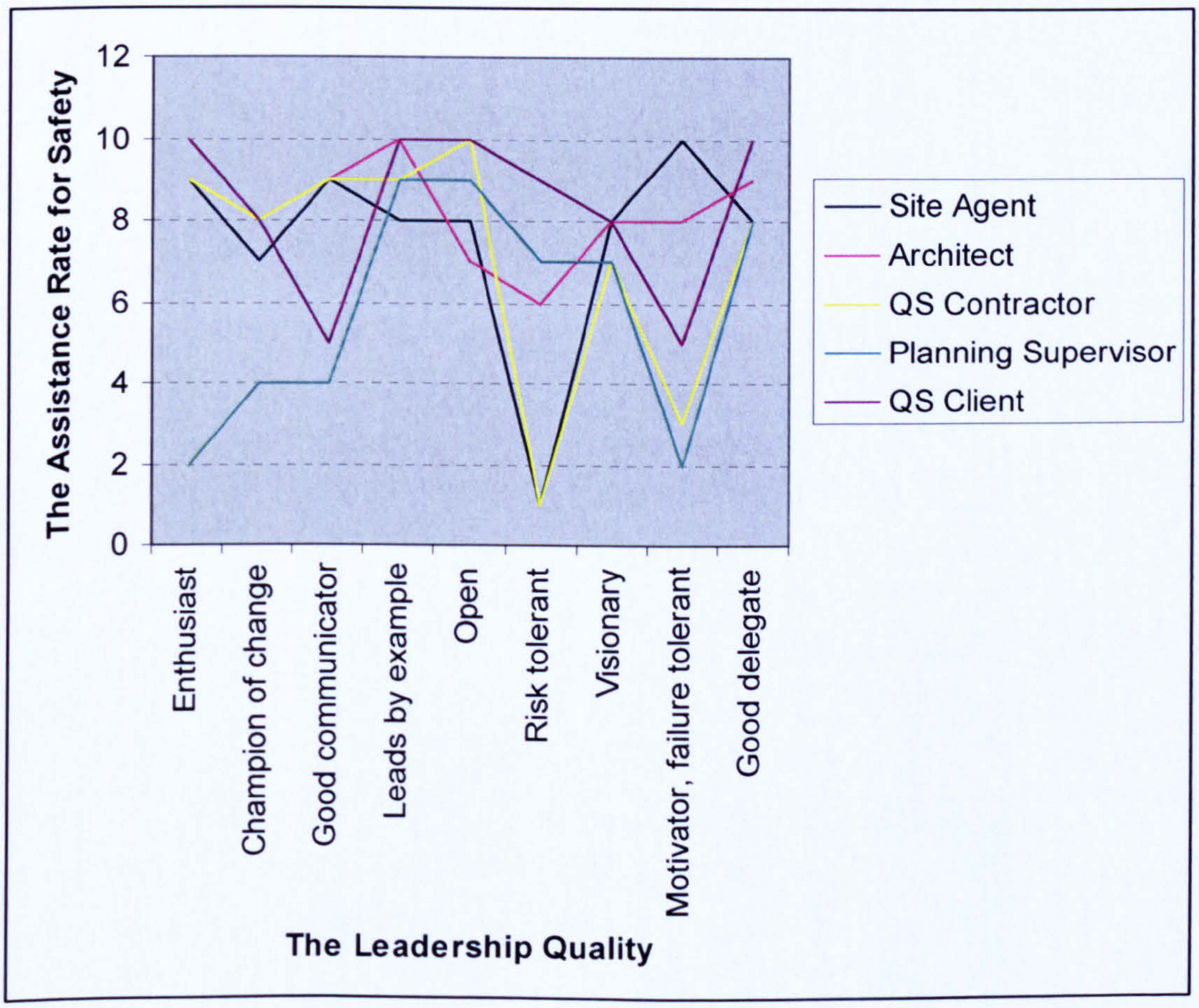

Figure 6.2 Leadership quality helping implementation of health and safety in UK

Table 6.2 Response of British Project Participants on leadership qualities for health and safety concerns

No.	Leadership Qualities for Health & Safety Concerns	Rating given by the Project Participants					
		Site Agent	Architect	QS Contractor	Planning Supervisor	QS Client	Total
01	Enthusiast	9	10	9	2	10	40
02	Champion of change	7	8	8	4	8	35
03	Good communicator	9	9	9	4	5	36
04	Leads by example	8	10	9	9	10	46
05	Open	8	7	10	9	10	44
06	Risk tolerant	1	6	1	7	9	24
07	Visionary	8	8	7	7	8	38
08	Motivator, failure tolerant	10	8	3	2	5	28
09	Good delegate	8	9	8	8	10	43

The following figure 6.3 shows the activities that help to improve health and safety practices perceived by the UK project participants. Most project participants believed that preparation of pre-tender health and safety plan will help improving health and safety practices. Furthermore, table 6. 3 describe personalities of the UK project participants toward health and safety. It shows the planning supervisor as the CDM regulation prescribed is the strongest personalities on health and safety perceived by the participants. However, the client has less personality among the participants.

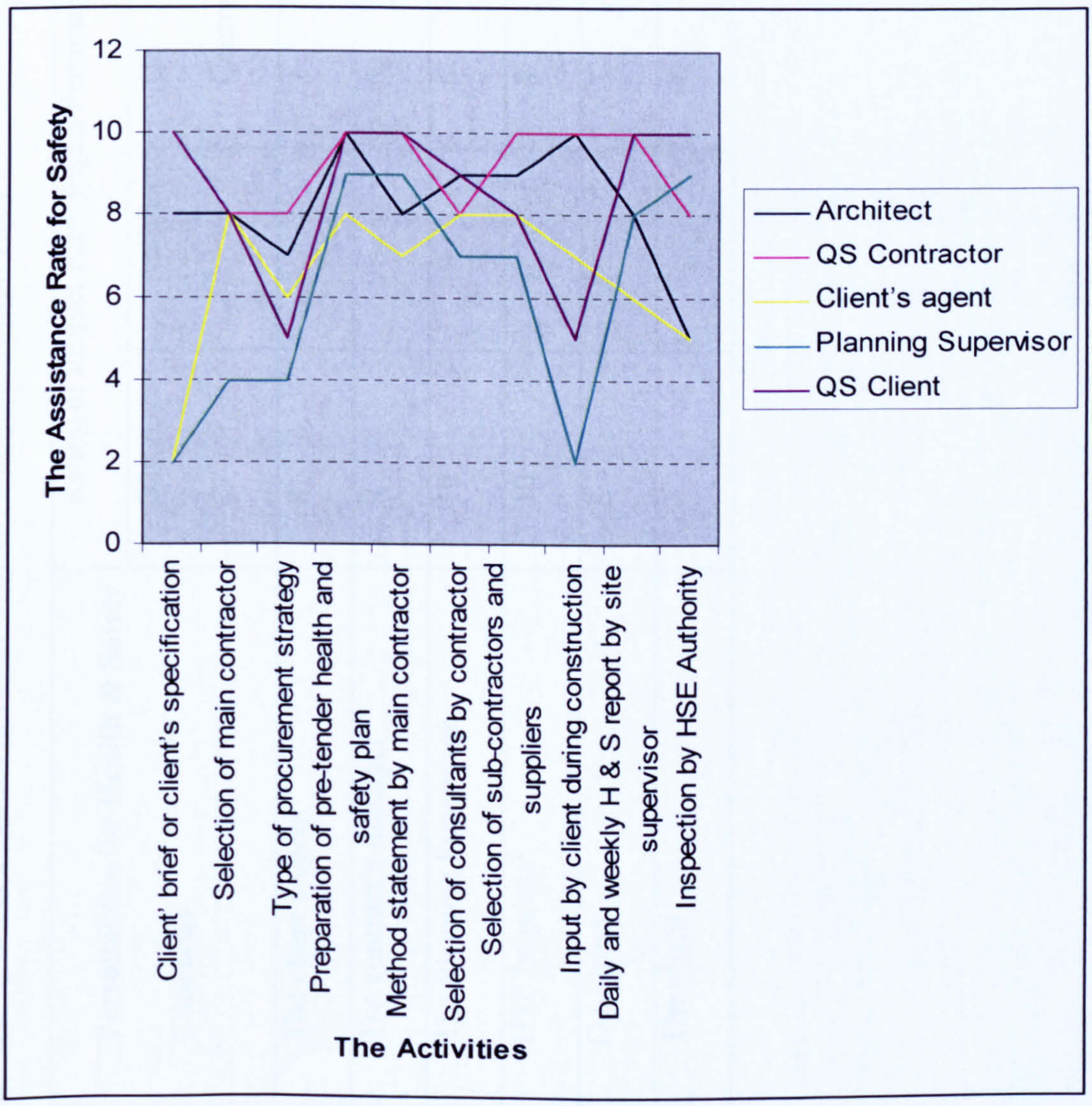

Figure 6.3 Activities that help implementation of health and safety in UK

Table 6.3 Rating of Personalities of British Project Participants toward H&S

No.	**Personalities for Health & Safety Concerns**	Rating of Project Participants Personalities					
		Site Agent	Architect	QS Contractor	Designer	Principal Designer	Total
01	The client's agent	8	9	2	8	5	32
02	The contract's manager	9	9	8	8	5	39
03	The Planning Supervisor	10	10	6	9	5	40
04	HSE Inspector	10	4	8	9	5	36
05	Designers	8	8	7	8	5	36
06	The client	7	7	8	2	1	25

6.4 Case Study 3 - The Putrajaya Precinct 3 Mosque- Malaysia

This is a prestigious project involving the construction of a mosque with the capacity of 20,000 worshipers in a new township. This township was designed to cater for all government offices and residential area near the capital of Malaysia, Kuala Lumpur. This project also includes the landscaping job or known as the 'Kiblat Walk'. The employer is the Town Council of the new township. The council appointed a Project Manager to act as the client's agent to run the project.

The cost of the project is in the region of RM 230 million or about 30 million pounds. The duration is 22 months. At the time of this study, the project was just started and the progress is about 6%. This is a traditional type of contract whereby contractors are invited to participate in an open system based on completed bills of quantities prepared by the consultant quantity surveyor. There was also a pre-qualification exercise to selected only qualified contractors to bid for the job.

Mapping Safety Activities

The method of collecting data for this project was done similar to the method done for the UK case study. Interview with key players, document search and site visits are the method used in this case. The first concern of this case study is to identify general information related to safety and health practices undertaken. Respondents from the main contractor, project management consultants, quantity surveyor, contractor project manager and contractor's safety officer were interviewed in order to get insight how the project is run subject to safety and health issues.

The Clients Role

The client for this project is a new town council called *Perbadanan Putrajaya* or Putrajaya Town Council, a new identity created by the Federal Government of Malaysia for the development of a new township to house all the government offices. The Technical Department is the department responsible for all technical and contractual matters for construction of the township. This is the section responsible for this project.

The client appointed a project manager or better known in Malaysia as the Project Management Consultant (PMC). For this project PMC is the KLCC Project Management Consultant. This PMC is well-known in Malaysia because of its success in the building of the tallest twin tower building in the world known as the Kuala Lumpur City Centre Twin Tower or KLCC. According to the client, the choice of PMC for this project comes from higher authority, i.e. ministry level and he agreed that the good record in building the KLCC is a significant factor in the selection process but he was not sure whether the safety record has also been taken into consideration.

According to the quantity surveyor and the architect the client has a clear and written policy about safety and all the consultants including the project manager agreed that the client has shown their interest in safety from the beginning of the project. The appointment of the project manager who has done a good job with the prestigious Kuala Lumpur Twin Towers is also an indicator that the client wants this project to be done successfully.

Selection of consultants

The selection of consultants was done by the client and with the recommendations from the Economic Planning Unit under the Finance Ministry headed by the Prime Minister himself. Any 'recommendations' can also be regarded as 'instruction' from the ministry and the council has to abide by the list of consultants for this project. The consultants selected for such a prestigious project normally of high calibre with vast experience. When asked about any consideration about safety record of consultants, the council said the term 'safety' to them means the consultants are professionals and have no doubt about the safety of the project they built. For site safety per se normally they said this is the responsibility of the contractor and the consultants have to ensure the main contractor do the work safely.

Selection of Contractor

All contractors in Malaysia have to be registered with The Construction Industry Development Board (CIDB) and an important criterion is that the contractor must be a *Bumiputra* contractor. The term *Bumiputra means* that the contracting company must be owned or at least 51% owned by the *Malays* which the main and original race in Malaysia. The priority of given jobs to Malays relate to the government's New Economic Plans whereby in the Malaysian Government is trying to 'balance' up the economic progress of the Malays and the Chinese who are well advanced economically. The contractors registered with the CIDB are categorized according to their specialization and the size of their company. In this case the contractor must be a Class A Bumiputra contractor. Another important criterion is working experience and it is stated that the contractor must have done a project of not less

than RM 30 million in a single job and completed within the last 5 years and need to provide their current financial standing.

In this project five registered contractors were selected in the pre-qualification stage. In this stage the design and specifications were already completed and most important criteria are cost and time. Regarding safety issue in the pre-qualification document there is an item in the instructions to tender participants concerning quality assurance and control program/safety programme but has been marked "NOT USED". This indicates that at this stage of tendering, the contractors were not required to submit any quality and safety programme for evaluation. The contractor is required to submit their organization chart and their current and expected workload. Whether this criterion is relevant concerning capability to do the job properly and safely is another question.

It is stated in the pre-qualification document (pre-q) about adhering to the relevant by laws and code of practices concerning health and safety, the relevant requirements were focused on the Department of Occupational Safety and Health Department Regulations. In the 'Current Project Performance' form to be filled by the contractors, the indicators of performance used is only the time taken to complete the project and if there are any delays the contractor has to state the reasons. There is no requirement to submit their safety record. This is due to the fact that there is no requirement in the by-law to make it compulsory for all contractors to record any accident or incident on site. This is also an indicator that at this pre-q stage, the safety records of contractors were not considered. According to the consultant quantity surveyor,

although there is a criteria regarding safety record of contractors bidding for the job, she admitted that it is not significant in this project.

Selecting Procurement Strategy

This is an open-tender or traditional type of contract. There is also a pre-qualification process to select a few contractors for the final submission of tender. According to the quantity surveyor, the client decided that this strategy and during pre-qualification process, the issue of safety record is not relevant. The most important criteria are technical capabilities and also experience. The quantity surveyor admitted that the safety record of the contractors were not looked into and of little significant during selection process.

In this case the design team were required to complete the design before tendering process and the most important criteria according to the quantity surveyor the cost is within their estimate. The contractor agreed that in this type of procurement they have no say whatever in term of site safety and although there are specific items in the tender document to price for safety, to quote a reasonable price is difficult.

Appointment of Safety Officer

According to Occupational Safety and Health of Malaysia (1997), any building project where the total contract price exceeds 20 Million RM, the contractor must employ a full time safety officer. In this case the contractor has its own safety officer. The contractor was also awarded the ISO 9000 certification regarding health and safety management. The safety officer leads a team of committee members in the safety department at the site office.

Safety Regulations in the Contract Document

An important requirement stated in the tender document is the need of the contractors to submit an Outline Tender Method Statement which is to include the plan for the performance of the works, including construction methods, sub-contracting, and logistics among other things. There are also the requirements of Quality Assurance and Control Programmes/ safety programme.

The employer or the client is the approving authority and the contractor is responsible to develop and implement QC in all stages of the work. The Tender participants were also required to submit a Safety Programme incorporating details of safety officers, safety inspection, safety manual and instructions, safety training programme, accident reporting, fire protection and medical aid facilities.

There were also a Special Provisions in the Contract to include site clearance, safety and environmental matters. Worker's accommodation is an important consideration in relation to site safety. In the conditions of contract it is specifically mentioned that the contractor must not construct any form of temporary accommodation.

All the tenderers were required to submit the above Safety Program and the successful contractor was not required to submit another program before the start of the work because they have submitted it during tendering process. In the contract it is clearly stated that contractor must fully comply with the client's Health and Safety Regulations. The contractors must apply for Safe Work Permit to the client before commencing any works that pose danger

to the public. The client makes it clear that it is the contractor's responsibility to keep work areas free of hazards. The contractor's safety officer must perform a formal inspection of the site at least once every two weeks to identify and correct any hazardous conditions and written record to be given to the client's safety management.

Accident prevention introduction and training were also discussed. The contractor must ensure that all employees are suitably trained in proper procedures and health & safety regulations, pre start meetings, prior to start work, and ongoing training before the start of new major segments of the work. Before starting work, the client's representative was contacted for specific instructions concerning known hazards and any special safe work practices. The contractor will review the safe practices with the client's representative and all other effected parties.

Safety meetings are of important coordination strategy for dealing safety issues related to the project development. Pre-start kick-off and method statement meeting were held before the work started. Contractor was required to present detailed method statement to the client's safety manager to explain how safety will be managed. Regular monthly site safety meeting has also to be conducted. Client will arrange a monthly safety meeting, chaired by the client's representative with the contractor's safety officer.

Safety committees hold a strategic position in delivering safety matters in the construction project development process. The contractor was required to establish a safety committees as required by Regulation 27 of the Factories and Machinery (Building Operators and Works of

Engineering Construction) and (Safety) Regulation 1986 and Section 30, part VII, of the Occupational Safety and Health Act 1994. The client's safety officer is be notified in advance of the meetings of the contractor's safety committee and be invited to attend the meetings. The minutes will be forwarded to the client within 7 days after the meeting. Daily Progress Meetings of safety will be an item raised at daily meetings between the client and contractor.

Toolbox Talks is also required to drive safety matters on board. It is mandatory that the contractor to set up tool box talks with the workforce. The client will require a written record of the tool box talks held, who conducts them and the topics raised. Tool Box Talks consists of a 10- minute safety session on site each week, to be held on a regular basis on a particular morning. They are conducted by the immediate front line supervisor of the workers concerned i.e. typically by a foreman for 10-12 workers. Topics can be provided by the client's safety officer but notes prepared by the contractors and/or subcontractor's staff which are specific to the work being undertaken are preferred. The purpose of this talk is to ensure:

- All personnel on site receive regular safety instruction,
- Front line supervisors are made to learn the contents of the talk and appreciate their own responsibility for health and safety,
- To seek feedback from the workforce about safety hazards faced during their activities.

In any of incident/ accident events, reporting of accident causation is required as the result of accident investigation. This section deals with the procedure of reporting any accident and

incidents. A special form is available for this purpose prepared by the client and must be made within 24 hours of the accident. Accident investigation is to be made by the contractor together with the client. A report together with recommendations will be prepared within 7 days. Investigations will be conducted in a blame free atmosphere. Near misses, first cases will be recorded but not required to be reported to the client, but data make available to the client whenever needed. Monthly safety report must be reported to the client, including number of employees, number of fatalities, number of more than days off work injuries, and no. of major serious accidents.

Section 2 of the tender document volume 2 concerns with safe work practices. In the introduction, it says that the following safe work practices and procedures while being specific in nature are not to be considered a complete safety programme but are to be indicative of the level of minimum safety involvement required in work performed.

Safety issues between main-contractor and sub-contractors

There is a clear and specific contract between the main-contractor and the sub-contractors relating to site safety. Before work can start the main-contractor has given the sub-contractors a set of safety documents to be agreed and signed by the sub-contractors concerning safety. The important agreed statements signed by sub-contractors are;

> *We certify that we received the above mentioned documents from main contractor (named).*

We will instruct all personnel under our control on the Safety and regulations before allowing them to commence work.

We will comply with all the above rules and regulations and laws, statutes, regulations of Malaysia, in particular, the "Building Operations and Works of Engineering Construction Regulation, 1986" and " Factories Act P. U (A) 328 and the Occupational Safety and Health act 1994."

These statements have been signed by all sub-contractors by their representatives.

Another important and successful method as claimed by the contractor is the penalty system imposed by the main-contractor. There is a system whereby the sub-contractor will be fined if their workers do not follow safety regulations and all fines will be deducted from the sub-contractor's progress payment. The amount of penalty fines received is used for safety promotion program at site.

Budget and or time constraints faced by main contractor and sub-contractor to complete the project are one of big issues that may lead to jeopardising health and safety. Main contractor and subcontractors need to buy items related to safety during construction such as safety and health facilities and personal protective equipments, etc. Another big safety issue is that contractor is perceived as the most responsible player for health and safety matters particularly on site. It is perceived by the contractor that not all parties are really concerned

with health and safety. It brings insight that safety is only treated as on site rather than overall project stages even though Putrajaya has a specific safety policy. In fact, the project management consultant does not have any safety and health training for its staff in order to help improving health and safety best practices. In this case, any parties who do not involve in production line on site are not really concerned with safety and health they can do for better achievement of zero incidents. It was found that many parties believed that no evidence that health and safety can improve productivity and quality of the project.

Safety activities during construction period

The main-contractor has played an effective and important role about safety during construction period. The regular tool-box meeting, monthly report to the client, an agenda in the site meeting relating to safety and the penalty system all pointed to the commitment of the main-contractor to ensure site safety. There are several types of safety meeting at different levels, e.g. technical meeting with the client and consultants, sub-contractors meeting, safety and health meeting with internal staff, and kick-off meeting.

Health inspector form the Department of Safety and Health will come on a regular basis to check the site. They are an enforcing body for the government to ensure all construction projects follow all regulations.

6.5 Case Study 4 – The District Police Headquarters of Terengganu-Malaysia

This project is the construction of a new police headquarters consisting of administrative block, workshop, hall, staff-quarters, mosque and store. The contract cost is RM 39 million

(5.8 million British Pounds) and the duration is 24 months. The procurement strategy is by direct negotiation using design build concept. The form of contract used is the Design & Build and Turnkey Contract (PWD FORM DB/T). The client is the Ministry of Internal Security and has employed an agent, Project Management Consultant to run the project.

Mapping Safety Activities

During procurement process, there were activities relating to health and safety matters. This includes selection of agent and consultants, determining procurement strategy, selection of contractors and activities to be done before the construction works start as well as during construction period.

Client's Role

The client in this case is one of the government ministries and they have their own method of selecting the consultants and contractors. Normally all government projects are managed by the Ministry of Finance and they have their own method of registered consultants. The consultants will help the client in all technical aspects and in the management of the project. In this case according to the quantity surveyor, the contractor has been chosen earlier and then the consultants later to work together with the contractor. There is no question about site safety at this stage and the selection of project manager, consultants and the main contractor. The client is responsible about the budget and time of the project.

Selection of Agent and Consultants

The selection of agent and consultants was done by the ministry concerned, and when the question of how the selection is done the agent and all the consultants stated that they have been short-listed by the ministry and attended an interview. In the interview according to the consultant quantity surveyor, the most important criteria is experience and must be 'local' consultant i.e. they must be from the state of Terengganu and has the main office with adequate technical staff. There is no question about site safety or safety record of consultants because to the client and the consultants this is not relevant.

Procurement Strategy

The procurement strategy used is recommended by the client and agreed by the contractor. The client gives only his requirements regarding functions and floor area. The quantity surveyor takes care of the costing to ensure within budget. In no instance in the design stage the aspect of safety was discussed. There was no pre-qualification process. Therefore there was no opportunity to check on the safety record of contractor. The contractor states that he was chosen based on financial and experience, not at any time the client asked about safety record. The contractor strongly agreed that the client should allocate some money for safety issues. According to the quantity surveyor, he agreed that at the design stage, no input from any team members about safety. He only uses the standard form and assumes that the safety issues rest on the contractor. He confirmed that safety record of contractor is not a criterion in the selection process. This is a design-built project as decided by the client and there is no reason given in the choice of procurement strategy.

Selection of Contractor

This is a negotiated contract, whereby the contractor is selected well in advance and then the negotiation regarding the cost and time of the project begins. The relevant ministry has their own criteria and the client's agent is given the task of negotiation about the cost with the selected contractor.

Activities before work starts

The contractor has to engage a permanent safety officer for this project in accordance to Malaysian safety law. According to the law, any project more than RM 25 million has to employ a full time safety officer. There is no requirement for the main contractor to submit a pre-construction safety plan and the quantity surveyor agrees that it helps if the contractor gives some sort of method statement prior to start work. The quantity surveyor stated that before works start they were only concerned about performance bonds and insurance being paid by the contractor and once these are fulfilled they can start work.

Main contractor and sub-contractors –safety issue

This is a DB project in which actually the contractor can take more chance to give input on how to improve the design in term of construction safety of the project. However, contractor did not really give input during design, because the other team members did not take any consideration about site safety during design stage but only structural safety. The contractor was not required to give any input in that stage. In this case the contractor carried out the work based on their most experiences all industry projects. Without the contractor's inputs they still manage to implement safety and health properly. The contractor has a good

relationship with subcontractors and the contractor has a good scheme to implement health and safety through subcontractor such safety meeting, safety penalties, and safety awareness. They have no specific contract with the sub-contractors relating to site safety but according to the contractor, most of the supplier and sub-contractors used to work with them before and understands their requirement regarding site safety.

Construction stage: safety issues

In this case study, it was found that during construction the contractor has a closed cooperation with subcontractor to implement health and safety practices since they have good safety systems, such as safety tool-box meetings, safety regular meetings, safety officer appointed, penalty system for neglecting safety and health by the workers, and they have a regular safety records. They always take the picture showing the neglecting safety by workers or any incompliance of safety by any parties on sites. This type of penalty whereby the picture of those not following safety regulations e.g. not wearing safety helmet is pasted on the board for all to see seems to work. They also penalise the workers by deducting their salary.

They have the safety committee and have monthly meetings. Safety record is presented during monthly site meetings. The contractor said that their experience working for oil-industry has make them well trained and concern about workers safety.

Client's role

The 'active' client in this case is the client's agent or the project management consultants. The contractor and the consultants acknowledged that they only deal with the agent. The agent is

quite particular about safety but according to the contractor but did not give any significant contribution during the design stage due to lack of knowledge. The contractor agreed that the client can give significant input during design stage but that did not happen in this project. In terms of budget by the client, the contractor agreed that if more money was allocated for safety it would help in upgrading safety measures. The quantity surveyor also agreed that the client was more concerned about cost and time and had little or no concern about site safety. The experience of the contractor in oil industry helped a lot in their safety policy. During construction period the client's agent depend solely on the contractor safety officer to implement safety on site.

Significant of procurement strategy

The design-build contract should give an advantage in terms of safety input by all parties during the design stage. But in this case, according to the quantity surveyor, there was no input or discussion about construction safety during design. He was on the opinion that during selection, safety record of the contractor was not one of the criteria. The quantity surveyor was unsure whether the drawings and specifications have clear instruction regarding health and safety.

Significant of team integration

Regarding teamwork and it concerns about safety, only the project manager shows some interest in safety. Other consultants were not that concerned. The client's agent i.e. the project manager shows some concern but does not contributes much in term of safety at any stage. The contractor claims that only the contractor is more concerned with all the regulations in the

safety issue. The contractor claims that during the design stage the input of all the team is important regarding safety. About knowledge, the contractor did not agree that the other team members know much about site safety. This is the main constraint that prevents any input by other team members at this stage.

Safety Documents in the Malaysian Project Procurement

In the case of project procurement process in Malaysia, the case study found that safety documents are mainly associated with safety and health on site as requested mostly in the form of contract. The case study in Police HQ Terengganu Project, the contractor, as an experienced contracting company in the oil and gas industry, provides a safety document containing safety and health procedures to be implemented on site. As with the design and built procurement system adopted for this project, the client relies on the contractor in designing out a safe construction process both in the design stage and construction stage. In this project, a safety committee consisting of project participants' representative is available. Health and safety reports are also established particularly related to construction operations on site.

In the case of the Big Mosque Project, the procurement system used is conventional system. The document searches in this case study found only safety matters related to contractors' responsibility as stated in the general conditions of the form of contract. No particular documents addressing safety and health in the design stage and pre-tender stage were found. It shows that in the traditional contract, safety matters are relied on the contractor's shoulder.

Quantitative survey among key players in the Malaysian Cases

The Malaysian Project Team Commitment for Safety

In this case study in Malaysia, the questionnaires focused on opinions or perceptions of the project participants about health and safety issues related to the procurement system of the project being studied. The questionnaires were sent to key project participants, such as safety officers of contractors, project management consultant, quantity surveyor, and architects. How their opinions regarding the procurement process and implementation of health and safety for the construction projects being studied are described below.

The project participants were then asked to make rating from 1 to 10 on activities that help in the successful implementation of health and safety during the production process for this project. Those activities include client' brief or client's specification; selection of main contractor; type of procurement strategy; preparation of Pre-tender health and safety plan; method statement by main contractor-health and safety plan; selection of consultants by contractor; selection of sub-contractors and suppliers; input by client during construction; daily and weekly health and safety report by site supervisor. However, only a few project participants submitted their opinion regarding this issue. Table 6.4 presents project participants rating scores of those activities that can influence to enhance safety and health. Findings show inspection or safety audit authority is the most important activities to enhance health and safety practices. It means that regulation or statutory approaches are still required to drive the implementation of health and safety in construction.

The Malaysian project participants also gave their opinion rating on how good leadership is critical for the success of any project. The quality of leadership is represented by enthusiast; champion of change; good communicator; leads by example; open; risk tolerant; visionary; motivator, failure tolerant; and good delegate. Table 6.5 describe the Malaysian project participants' response by giving rating score from 1 to 10 representing lowest to highest score. Findings uncover that lead by example, good communicator are the most influential indicators of the leadership qualities to enhance health and safety culture and practices.

Table 6.4 Response of Malaysian Project Participants on the activities that help in the implementation of H&S

No.	The activities that help in the successful implementation of health and safety for the project	PROJECT PARTICIPANTS			
		Architect	Quantity Surveyor	Safety Officer	Total
01	Client' brief or client's specification	8	2	4	14
02	Selection of main contractor	8	3	4	15
03	Type of procurement strategy	7	2	4	13
04	Preparation of pre-tender health and safety plan	7	1	4	12
05	Method statement by main contractor	7	1	5	13
06	Selection of consultants by contractor	4	3	5	12
07	Selection of sub-contractors and suppliers	7	2	6	15
08	Input by client during construction	8	1	6	15
09	Daily and weekly H & S report by site supervisor	6	3	6	15
10	Inspection by HSE Authority	7	2	7	16

Table 6.5 Response of Malaysian Project Participants on leadership qualities for health and safety concerns

No.	Leadership Qualities for Health & Safety Concerns	PROJECT PARTICIPANTS		
		Architect	Quantity Surveyor	Total
01	Enthusiast	4	2	6
02	Champion of change	4	2	6
03	Good communicator	6	3	9
04	Leads by example	8	1	9
05	Open	6	1	7
06	Risk tolerant	5	3	8
07	Visionary	4	2	6
08	Motivator, failure tolerant	3	1	4
09	Good delegate	5	2	7

In the Malaysian contexts, activities that help in the successful implementation of health and safety for the project were viewed differently by the Malaysian project team, such as architects, quantity surveyors, and safety officers. Figure 6.4 shows the project activities that are regarded as contributory factors to improve the implementation of health and safety. According to architects, client's brief or client's specification will help significantly for the successful implementation of health and safety. This can be argued that architects mainly work under guidance of client's brief and they see the brief will influence the design of building. However, the architects believed that selection of consultant by main contractor in the case of design-build project does not really provide better implementation of health and safety.

Different from the architects' view, quantity surveyors of Malaysia felt that the activities will only help a little to improve implementation of health and safety. This view shows that quantity surveyors only look at selection of contractor and consultant as well as activities by site supervisors will assist a bit for a successful implementation of health and safety. Only inspection by HSE authority believed by safety officers of Malaysia will have a lot of benefit to better implementation of health and safety. According to the safety officers, some activities of pre-construction have very little impact on health and safety implementation.

Client's role

In this case, the client's role in general is very positive towards achievement of health and safety improvement. Even though the client only has a very little direct role to the implementation of health and safety, but they have a very clear safety policy. It was evident

that the client has already appointed an experience project management team to govern all the project matter particularly on the implementation of health and safety.

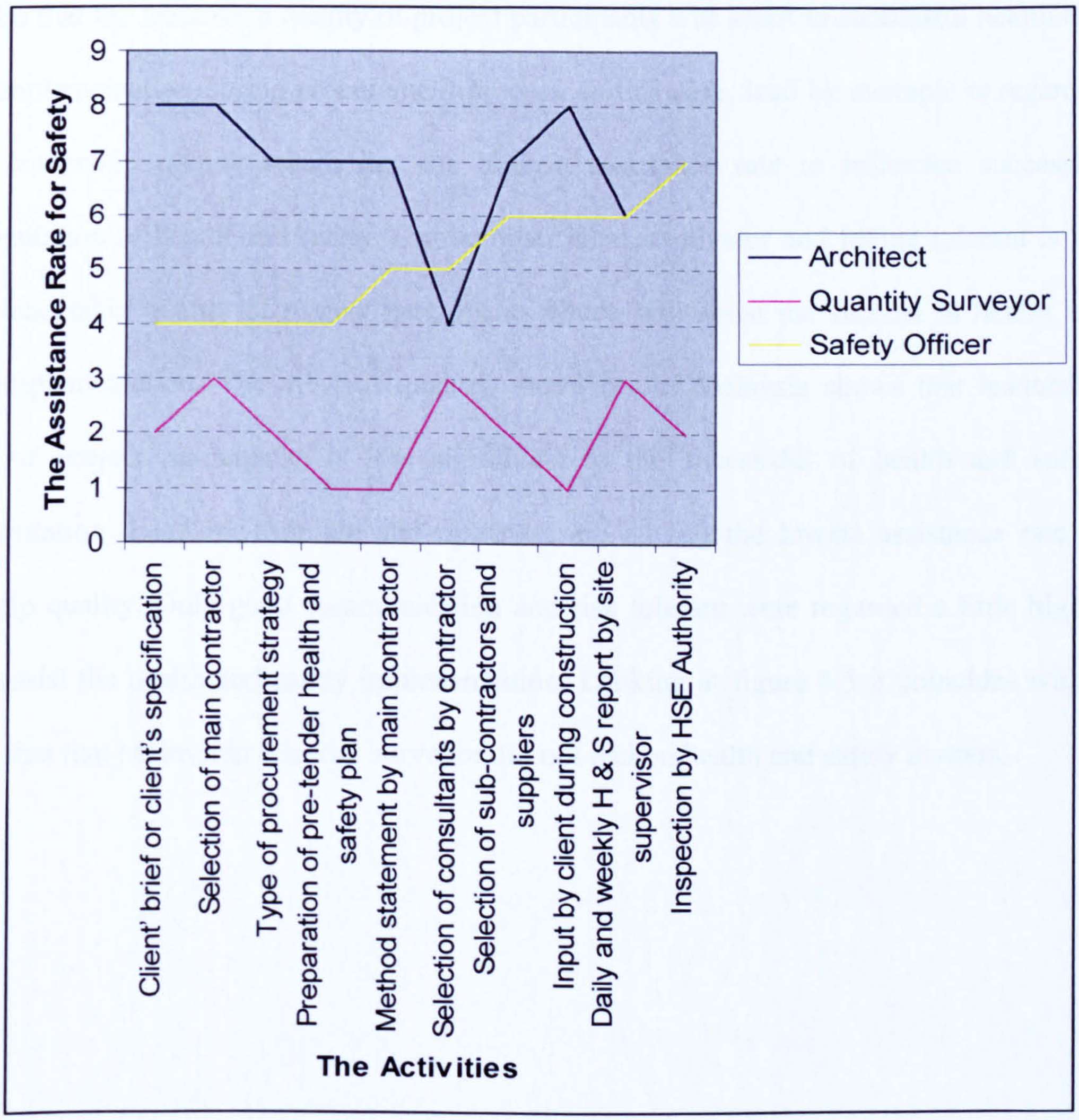

Figure 6.4 Activities that help in the successful implementation of health and safety

Project participants can help significantly for health and safety implementation. However, it depends on their leadership quality regarding their concern of health and safety. In the case of Malaysia Projects, architects and quantity surveyors have different perception on how project participants' leadership quality assists in the implementation of health and safety. The

following figure 6.8 describes leadership qualities for health & safety concerns and their rate in assisting health and safety implementation. The Malaysian architects were very confident to reckon that the leadership quality of project participants will assist to successful health and safety implementation during procurement process. In this case, lead by example is regarded as the leadership quality which has the highest assistance rate to influence successful implementation of health and safety. On the other hand, motivator and failure tolerant is the lowest leadership quality of project participants which will assist the success of health and safety implementation. The view of quantity surveyors of Malaysia shows that leadership quality of project participants is less significant to the successful of health and safety implementation. Lead by example and openness are among the lowest assistance rate of leadership quality. Only good communication and risk tolerant were regarded a little higher rate to assist the health and safety implementation. Looking at figure 6.5 it coincides within the fact that that Malaysian quantity surveyor did not reckon health and safety matters.

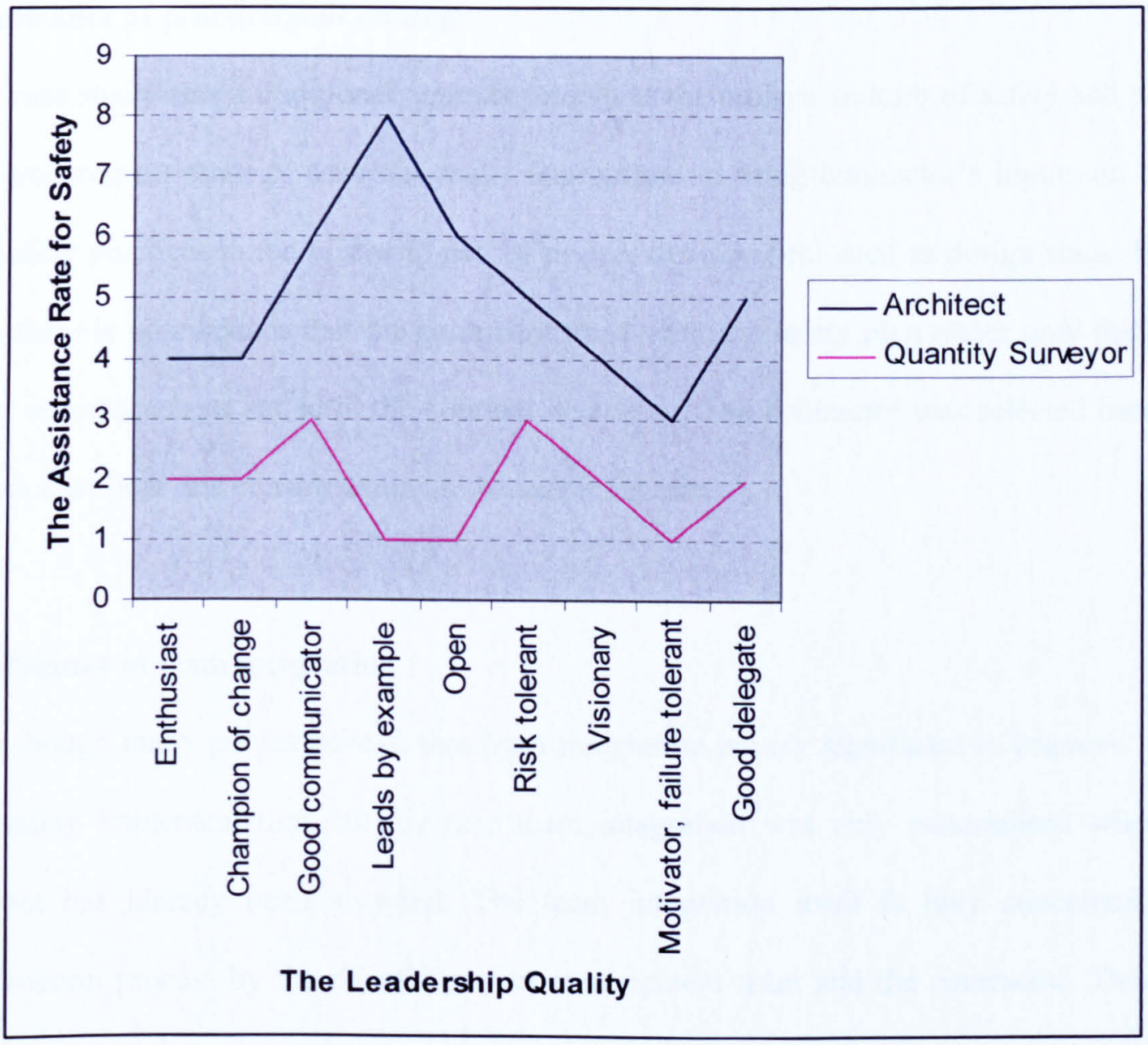

Figure 6.5 Leadership for implementation of health and safety

This evidence shows that quantity surveyors of Malaysia were only concerned with cost matter only. Most procurement here in Malaysia uses open tender where in the pre-qualification process does not deal with safety and health issue. In the higher learning institutions, quantity surveyor training hardly deals with safety and health.

Significance of procurement strategy

This case study uses a traditional contract to deliver the project. In term of safety and health, this procurement strategy does not really appropriate to bring contractor's inputs on health and safety practices in the upstream part of project development such as design stage. In this case, there is no evidence that the contractor must submit a safety plan rather only fulfil any safety requirement as stated in the contract document. The contractor was selected based on the price without due consideration on the safety aspects.

Significance of team integration

Even though many parties believe that team integration is very significant to improve health and safety implementation, in this case team integration was only materialised when the contract has already been awarded. The team integration itself is only concerned with construction process by the client's project management team and the contractor. This case study shows that there was no opportunity of the designers to take into account any inputs from the contractor.

6.6 Summary and Conclusion

This chapter discusses findings of the case study. Firstly, the discussion of interviews conducted during the process of case studies both in the UK and Malaysia. Secondly, the questionnaire feedbacks from the project participants concerning safety matters related to procurement process they have been involved in were described. Finally, opinions and perception of the industry stakeholders in both countries were presented to verify and validate

some findings of the case study, such the project participants' view regarding the existence of safety matters in the project studied.

Findings of the interviews show that the procurement process in the UK has dealt with health and safety issues since the beginning of project stage as required by law of CDM Regulation. In this case, the client appoints a planning supervisor to address any undermining safety on the production line as a result of design. The coordination between the planning and designers has taken place to consider any safety related to design. The client also required the tenderers to submit pre tender stage health and safety plan to be included in the tender proposal. The contractor was also asked to provide method statement where safety and health is also included. However, the project procurement process in Malaysia has not been regarded as the driver to enhance safety. Although safety and health have already included in the standard forms of contract, this matter is only concerned with safety matter on site. Therefore, health and safety is only looked as the downstream of project development process rather than embedded in the whole life cycle of project.

In general all propositions were verified in the UK cases, but not for the Malaysian cases. This can be seen that under CDM regulation in particular, the client of the project is required to implement health and safety practice across the procurement process. The existing planning supervisor in the procurement system in the UK has improved safety and health concern in the construction project and it brings more team integration in term of safety and health practice since in the beginning of the project development process. It is clearly stated that the award of the contract is not only determined on ground of price and technical ability but also on the

past of safety record as well as safety and health plan. In the UK cases, designers were pushed to draw much attention by designing out health and safety risks. The designer should make any effort to avoid, reduce or transfer any risks through their design.

In the case of Malaysia, even though the proposition were difficult to verify, there are many evidence from the interview sessions that the clients should take leadership in order to implement health and safety practice on the ground and the procurement process was also seen as a potential to drive the implementation of health and safety. Therefore, it is sensible to suggest that the procurement system needs to include any safety and health issues across the stages of project development process. However, it was perceived by many people interviewed that more team integration is required to attain successful implementation of health and safety.

It was found that project participants, from the client's agents, architects, principal designers, quantity surveyors and contractors mostly agreed the following safety and health issues related to the procurement process in the projects studied.

- The Pre-tender health and safety plan provided by the client has sufficient information for contractors to prepare for the post contract health and safety plan.
- The contractor companies' safety records have significant influence on the success of the bidding for this project. It can be as lessons learned for future development
- All sub-contractors and suppliers were given adequate instructions or information regarding your company's health and safety policy to ensure they understand your company's stand regarding health and safety.

- The clients' health and safety policy in this project has significant impact on the overall success in term of health and safety of the project.
- The preparation of the Pre-Tender Health and Safety Plan for the project was based on completed drawings and specifications; therefore this helps the contractor to prepare for the health and safety plan for the project in detail, including adequate cost consideration for the health and safety.
- The traditional method of tendering for the project means that the contractor has no opportunity to be involved in the early stages of design and give some input in relation to health and safety of the project.
- The client has an important role and influence in ensuring all parties are serious in implementing health and safety in the project.
- The client is instrumental in leading the team to ensure everybody plays their role in the implementation of health and safety during the design stage of the project.
- The main contractor has strong influence on the commitment of their sub-contractors and in this project the main-contractor has given enough information and instructions to the sub-contractors regarding health and safety.
- During the construction stage, the client's agent can have more impact on the safety culture of the workers by direct contact e.g. dialog, discussion with the site operators regarding health and safety.
- The early involvement of all parties in the early stage makes it easier to ensure that the health and safety of the project is taken care of in the design stage.
- Compare to the traditional type of tendering, the two-stage tendering adopted in this project is more successful in working as a team right from the early stages and

this greatly enhances the chance of success in terms of time, quality, cost and safety

- In ensuring that the site operators follow all the health and safety regulations, the involvement of the client on site is important, and their regular sites visits and have direct communication with the operators will have great impact on their safety behaviours.
- The information given by the client's agent is good enough for the contractors to submit a good proposal with due regard to health and safety.

CHAPTER 7: CROSS-CASE ANALYSIS

7.1 Introduction

The purpose of this cross-case analysis is to make analytical generalisations based on the research objectives and propositions which have been established earlier in chapter 1 and chapter 2. This cross-analysis enables for literal and theoretical generalisations which is important in a case study research.

7.2 Cross-case analysis report

This report is based on the three propositions established as stated in chapter 5 as follows;

1. Client has significant role relating to safety,
2. Procurement is an important tool to enhance safety and
3. Team integration is critical in promoting safety.

The analysis of all the cases will be based on the above propositions and a comparative study is conducted to produce analytical generalisations.

Client's role relating safety

Case study1 (Helsby High School Drama and 6th Form Block, Cheshire, England)

In this case it is necessary to identify who the client is because there are 3 parties that are involved. The Council and the School Board are the direct sponsor and beneficiary to this

project. Both contribute to the financial aspects. The Council is the party responsible for all the technical and has the power to choose the consultants and contractor. The school Board is the end user and provides all the relevant information to the Council related to the requirements of the proposed building. The Council in their capacity has employed an agent, a quantity surveying firm to act on their behalf in running the project.

All the three parties have their contributions in relating to safety issues in this project. The Council has used its discretion to choose an agent whom they have very high confident and has a very good record over the years. As stated earlier the agent has been offered the job 'over the phone'. This indicates the confidence of the Council towards the agent.

But, the agent agreed a little that the client has a clear procurement policy for this project and has given clear instructions to follow to ensure the success of the project. He remarked that *"...there was a need for the project to be tendered and the council identified a requirement for design and build. The basis of the tender documents was identified by us..."* The employer's agent agreed that as the client's agent are given the full mandate to manage the project and this includes the provision of a procurement strategy for the project.

The local council as the client in this project has a clear and an established policy regarding health and safety. They have regularly meetings to upgrade the health and safety policy and clear instructions are issued from time to time to all the relevant staff dealing with construction project. In a minute of one of the meetings concerning health and safety, among the issues discussed that how to ensure that the consultants carry out the CDM roles and

duties as set out in the Terms and Conditions of their appointment. This shows their seriousness in handling the health and safety issue. All consultants and contractors registered with the council were pre-qualified to ensure that they have an adequate health and safety policy and according to the council, the list of consultants and contractors are being reviewed from to time to ensure their safety records are being updated. All contractors recommended to tender for this project are listed contractors with approved safety record. The client's agent was given by the council three (3) names of contractors to be invited to send their proposals for this project. Because it is a design-build project, the designers were chosen by the individual contractor.

The School Board although is not an 'active' client in the beginning of the project, their contribution can be traced during construction period whereby a representative of the school and in this case the Headmaster, is always present at the site meetings. Some comments and input given by the school during the meetings e.g. suggestion on how to control students from coming near the site, what type of floor finishes they required is beneficial for the designers.

The client's agent has the biggest contribution in implementing safety. The leadership of this project has been delivered to the agent when the letter of appointment and terms of reference was issued. The influence of the clients in this project is considered as minimal but important. The choice of an experience agent has shown to be a success. According to the agent, the client has given a full mandate to manage the project and this includes the choice of procurement strategy for the project. The client (local council) indicates a need for the project

to be tendered and identified a requirement of design and build but the basis of two-stage tendering strategy was identified by the agent.

The two-stage tendering strategy adopted for this project is successful in a number of issues. Firstly, the cost is carefully monitored in the design stage whereby the contractor is given a clear instruction not to exceed the cost target. The design-build strategy has given the contractor to work together with designers of his choice and this makes it easier to work as a team from the beginning.

During the construction stage the client has specifically allocate the safety issue as an agenda in the site meetings and this helps to keep track of all site safety issues.

Has the client given enough attention relating to safety issues? The architect, contractor and even the client's agent were in the opinion that the Council itself has not enough technical knowledge to give significant input relating to safety during the design stage. The architect acknowledged that the client's agent has the technical capability to ensure all parties play their role relating to safety. The planning supervisors from both client and contractor played major part in implementing safety.

The client also made sure that before the contractor can start work on site, they had submitted their safety–plan. This is a very effective way of ensuring that the contractor has taken care of all issues relating to site safety before work starts.

Finally, the agent stated that the client's agent and as the leader of the production team he has little influence on the overall health and safety of the project. However, the employer agent disagreed that although he has no direct contact with the sub-contractors and suppliers, as the client's agent he can be very influential in ensuring the main contractor maintains high standard of health and safety practice during the project. He further remarked that "*...responsibility lies with the contractor who we can try and influence the sub-contractors.*"

The architect agreed that the information given by the client's agent is good enough for architect to submit a good proposal with due regard to health and safety. He then proposed that "*....as professionals we should be considerate of health and safety always...*" He also agreed that the main contractor is the project participant who has greater influence regarding health and safety in this project. He asserted that "*...it is the main contractor who will construct the scheme and them who produce method statements etc. However it is the clients overall responsibility...*" Furthermore, he agreed a little that the client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project. He quoted that "*...many clients do not have an understanding of construction so they are reliant on professionals for advice. They should however not absolve themselves from any interest in health and safety...*" He was unsure that the clients have great influence on the health and safety issues and provides significant input during the design stage, as he remarked that "*...some clients are more involved than others, sadly most are purely interested in the procurement of their building/ scheme...*" Furthermore, the architect strongly agreed that the freedom of choice of consultants by the main contractor makes it easier to work as a team in this project. He explained that "*...once the main contractor has established a good working*

relationship with particular consultants it makes good sense to build on recognised working practices rather that learning the ways of individual consultants each time..."

The site agent agreed that the client has an important role and influence in ensuring all parties are serious in implementing health and safety in the project. He also agreed that during the construction stage, the client's agent can have more impact on the safety culture of the workers by direct contact e.g. dialog and discussion with the site operators regarding health and safety.

Case study 2 (Langworthy North–Refurbishment/ of Terraced House UK)

In this case, the Principle Client is the City Council and the section which is responsible for the technical running of the project is the Architectural and Landscape Design Section. To the contractor involved and the independent safety officer, the client is the one they have direct instructions i.e. the architect as the team leader. Therefore to them they refer to the Architectural and Landscape Design Section as the client. The established policy of the client (City Council) has significant impact on safety in the way that at least all contractors have been pre-qualified and their safety record scrutinized.

It is interesting to note that in this case the safety record of the main contractor has worsened for the last 2 years and still won the project. The quantity surveyor and the safety officer agreed that this shows that the safety record has little or no impact on the selection process of the contractor.

The principle designer when asked about the client's (Council) role or input regarding safety in this project clarifies that the Council is not technically competent and relies totally in the technical department. At any stage of production there is no input from them, their role is only to provide a list of registered contractors for tendering purposes. The client relies on the safety officials to ensure all parties abide safety regulations. The technical department feels that the design and the pre-tender safety plan stage is the most important stage regarding safety in the project.

For the designers, they strongly agreed that the health and safety policy of the client in this case is well documented and the team fully understands the importance of considering health and safety in design of the project. The contractor was also satisfied with the client in providing all information especially the pre-tender safety plan and this helps them to prepare pre-construction safety plan successfully.

He also strongly agreed that the preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they form a good basis for the contractor to price the job without compromising on health and safety. However, he was unsure that the client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project. He specifically mentioned that "…our clients are not technically aware. They see health and safety as the design team or contractors responsibility".

The architect only agreed that the health and safety policy of the client is well documented and the team of designers fully understand the importance considering health and safety in all their designs including the design for this project. He also agreed that the preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they were formed a good basis for the contractor to price the job without compromising on health and safety. However, he totally disagreed that the client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project. He specifically mentioned that "....clients had no involvement".

The quantity surveyor also strongly agreed that the client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project, but he only agreed that the safety records of the contractors submitted during the tendering process has little impact on the selection process because only contractors listed with the council were called to tender and they have approved health and safety record. He remarked that "...most of the contractors tendered for any project have been through inspection process conducted by H&S department..."

The safety officer of the contractor agreed some of the following statements. The Pre-tender health and safety plan provided by the client has sufficient information for preparing for the post contract health and safety plan. However, shortage of information is usually in the form of lack of drawings for services i.e. gas, electric, and water.

The Contractor's Safety Officer specifically rated that the client's influence in the implementation of health and safety in this project at the design stage is very high. However, he rated that the client's influence in the implementation of health and safety in this project at the construction stage is less than design stage. In fact, he fully agreed that in ensuring that the site operators follow all the health and safety regulations, the involvement of the client on site is important, and their regular site visits and has direct communication with the operators will have great impact on their safety behaviours. Further comments from him "..... I feel this is useful if concerns are given to the contractor and he takes appropriate action as he is responsible for health and safety at this stage. Very often the client still believes he is responsible which can cause friction". Finally he agreed that it is still difficult to ensure every worker on site follows all the safety regulations especially regarding the wearing of safety helmets and boots at all times despite their knowledge about the regulations.

The H & S safety official also gave a strong agreement that the client has an important role and influence in ensuring all parties are serious in implementing health and safety in the project. In fact, he also strongly agreed that the safety record of the contractor submitted during the tendering process has little impact on the selection process. Further, the officer agreed that the client is instrumental in leading the team to ensure everybody plays their role in the implementation of health and safety during the design stage of the project. However, he strongly agreed that if the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility that the standard of health and safety is lower than required. He then agreed that the client's health and safety policy is well documented and all

bidders for this project were given enough information to ensure that they have taken serious thought about doing the project safely.

Case study 3 (The Putrajaya Precinct 3 Mosque- Malaysia)

The client in this case has appointed a competent project manager to run this project. The client has a clear safety policy to ensure that the project was done according to the laws and regulations. The inclusion of the Outline Tender Method Statement for all tenderers in the first stage of tendering i.e. the pre-qualification stage is a good indicator of the positive input by client relating to site safety. The choice of procurement strategy i.e. traditional tender by client does not contribute significantly to site safety issue. No consideration of safety records of the contractors were submitted in their tender. It was shown that the choice of tenderers did not take into account the safety issues by the client.

In this case, many players believed that the client has potential influence to enhance health and safety practice across entire project development process. The client should have imposed safety record as a criterion and also a lump-sum or a provisional sum should be allocated for safety in the tender document. The role of the client in this case has been taken over by the project manager right from the initial stage.

When asked about which stage in the production process did the client gives strong concern about health and safety, the contractor said it was only regarding the structural safety. The client also receives monthly safety report from the contractor and every safety meeting the client's representative is present. All the consultants and the contractor agreed that the project

manager on behalf of the client had played an important role to ensure all safety regulations are followed during construction.

Case Study 4 (The District Police Headquarters of Terengganu-Malaysia)

The client in this case did not contribute in terms of safety. The client set the budget and the rest the project manager takes over. The main-contractor,

> *'.. We deal with the project manager direct who is the client's agent. In term of safety, not much, all parties assume safety design means the building will not collapse-but how to build the building safely-we have to do that ourselves."*

The client has no technical expertise to consider safety and leaves everything to the project manager. Even the choice of procurement i.e. design-built has no relation to the safety issue and the project manager has been given the instruction to follow what the client wants. Only at the construction stage the client concerns about safety whereby safety records are presented during site meetings.

Procurement is an important tool to enhance safety

Case study1 (Helsby High School Drama and 6th Form Block, Cheshire, England)

The work 'procurement' means 'the framework within which construction is brought about, acquired or obtained (McDermott, 1999). This means all activities by all parties from the very beginning until completion of a project can be termed as procurement process. In this process there are avenues whereby those involved in the production process can utilize to improve safety issues.

The Council as the main client for this project has a safety policy concerning contractors who wish to register with the Council. The pre-qualification process to ensure that the contractors have acceptable safety standard is a good start in the procurement process. The client's agent agreed that in term of safety record of contractors who bid for this project; this has been taken care of by the Council.

The selection of agent for this project is a bit too simple and straight forward but in terms of experience; there is no doubt because the agent has done a lot of jobs with the Council. Although there is no 'formal' selection process in selecting the client, due to the size of the job, the experience, track record of the agent the Council feels comfortable to appoint the agent 'just over the phone'.

The agent was given by the Council 3 names of the contractors in the first-stage of tendering. Since the contractors are registered with the Council, the agent has no queries about their safety status.

An important element in the first–stage of the tendering process is the preparation of the Health and Safety Plan at the Pre-Tender Stage by the client's Planning Supervisor. This is an important document for the contractors indicating the preparation and allocation to be addressed in relation to the safety of the project. It is an important indicator and helps the contractors to be aware in advance before the work starts.

Once the contractor has been selected the architect on behalf of the contractor prepares the "Risk Assessment Record" or the method statement which is part of the Health and Safety Plan-Construction Phase as required by the client. Before the work can start, this is an important process to ensure the contractor knows about risk and be prepared. Only with the client's consent and approval of the Health and Safety Plan, the contractor can start work. The contractor is again obliged to give a 48 hour notice prior to start of work.

The role of Planning Supervisors in this project is crucial for both client and contractor. They are the key figures to ensure all parties know and play their role in implementing safety in the project. The appointment of an independent Planning Supervisor by the contractor to verify his actions regarding safety is another interesting aspect in order to verify the main contractor's activities concerning site safety.

The main contractor has a clear safety policy to ensure all sub-contractors play their roles with regard safety. The sub-contractors were given a document called 'Safety Requirements for all Sub-Contractors', which clear shows the requirement for the sub-contractor to provide a method statement describing fully the working procedures and need to be approved by the main contractor before work commences on site.

All the parties in this project agreed that the design-build strategy adopted by the client has shown positive and significant teamwork from the early stages of the project. Even the school Board has given small but significant input for the designers. The Two-Stage tendering makes

it possible for the selected contractor to design the project according to time and budget and also incorporate the Pre-Construction Safety Plan for the client to evaluate.

The client's agent strongly agreed that the schedule and budget have considerable impact on the type of procurement adopted for this project and the early involvement of the main contractor makes it a better chance of completing the project within time and budget. He also agreed that the early involvement of all parties in the early stage makes it easier to ensure that the health and safety of the project is taken care of in the design stage.

The quantity surveyor of the main contractor strongly agreed that the two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage. Further the contractor also agreed that the company's safety record has significant influence on the success of the bidding for this project and the client has great influence on the health and safety issues and provides significant input during the design stage. He agreed that provision for health and safety has a significant financial impact on this project. In addition, he strongly agreed that the Pre-tender Health and safety plan is good enough for the purpose of preparing the method statement for the project and useful for the pricing of health and safety for this project; and the type of procurement chosen for this project has given the contractor a significant opportunity to give input in the early stages of the design stage in terms of health and safety. Finally he also strongly agreed that the procurement method used in this project is better than open-tendering method because the contractor has a better opportunity to incorporate the health and safety aspect during the design stage and this allows for adequate

allocation for health and safety; and all sub-contractors and suppliers are given instructions or information regarding their company's health and safety policy to ensure they understand their company's stand regarding health and safety.

The architect strongly agreed that the two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage. He asserted that "...it has been reasonably easy to share information and highlight points of conflict particularly within design..."

Case study 2 (Langworthy North–Refurbishment/ of Terraced House UK)

The traditional procurement strategy means that the main contractor comes late in the initial stage and has no direct contact with the client or design team before tendering process. The architect is happy with the design team and they have played their role regarding safety during the design stage. According to him this is just another ordinary project and when choosing the procurement strategy, health and safety is not a significant factor. The 'screening' of the contractors relating to safety record in this case was done but what the significance is questionable. As before stated that the record of the lowest-tenderer was not encouraging and can be a basis for rejection is ignored. The quantity surveyor also stated that this lowest tenderer is about 12.5 % lower than the quantity surveyor's estimate but this does not raise any doubt regarding its impact on the level of safety. Only the safety officer stated his concern and strongly agreed that the lower price can give significant impact on the standard of safety provided by the contractor.

According to the architect, the submission of safety plans both at the pre-tender and pre-construction stages is important because the extent of safety level can be examined by all the parties concerned. All the drawings and specifications were ready at the tendering stage and the risk assessment report prepared by the client so that all bidders were aware of the risk involved the proposed project.

When asked specifically about choice of procurement, selection of contractor, selection of designers, pre-qualification, drawings and specifications, the principal architect indicated the activities that give most significant contribution regarding health and safety are the selection of contractor and pre-qualification.

The safety official working for the contractor pointed out that in this project the important event that she regarded as giving significant impact on overall safety is the submission of the safety plan to the client and being accepted before work starts. She also agreed that the design stage is crucial in determining safety on the construction site because as she put it, *'complete design helps contractor to be well prepared'*.

All the respondents in this case i.e. the design team, planning supervisors, the contractor and his safety officer agreed that the traditional method used in this project has prevented the contractor from giving any input regarding health and safety during the design stage. But most of them also agreed that this is not that significant because of the nature of the job which is not that complicated. According to the quantity surveyor, he strongly agreed that the pre-

tender health and safety plan for this project was based on detailed design and specification and they formed a good basis for the contractor to price the job without compromising on the health and safety requirements.

When asked about budget the safety official for the contractor only slightly agreed on the fact that the open tender process will make the contractor in dilemma in allocating more money for health and safety which might jeopardize the chance of winning the tender. Relating to the contractor's price which is lower than the client's estimate which might affect health and safety, the client's quantity surveyor disagreed because all the requirements have been stated clearly in the Bills and further more regular inspections by safety officer will prevent the contractor from compromising on health and safety. But the independent safety officer strongly agrees that the lower price will have significant impact on health and safety of the project.

The Principal Architect agreed that the safety record of the contractor submitted during the tendering process has little impact on the selection process. He quoted that "...however where we use non-listed contractors, their H&S record is closely scrutinised". The designer also strongly agreed that the traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stages of design and give some input in relation to health and safety of the project; and if the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.

The architect and the quantity surveyor agreed that the safety record of the contractor submitted during the tendering process has little impact on the selection process. The architect also strongly agreed that the traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stages of design and give some input in relation to health and safety of the project; and he slightly agreed that if the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.

The quantity surveyor agreed that the provision for health and safety in this project has significant implication on the total cost of the project. Further he comments that "...it may involve such costing on H&S requirements stated in the bill. This will include the protection and scaffolding. In addition the insurance costs will be necessary..." He strongly agreed that the preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they formed a good basis for the contractor to price the job without compromising on health and safety. He provided a further comment "...a classical example can be seen in terms of contractor's pricing on scaffolding. Higher level of job may involve higher cost of scaffolding due to H&S requirement..."

The quantity surveyor strongly agreed that the traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stages of design and give some inputs in relation to health and safety of the project; and he disagreed that if the selected contractor's tender price is lower that the client's estimate for this project, there is a possibility the standard of health and safety is lower than required. He put further comments

"…not necessary because H7S requirements have been stated clearly in the bill. Furthermore, the regular inspection by H7S does not permit them to compromise H&S…."

The planning supervisor agreed that the provision for health and safety in this project has significant implication on the total cost of the project. He only agreed that the preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they formed a good basis for the contractor to price the job without compromising on health and safety.

The planning supervisor also disagreed that the client has an important role and influence in ensuring that all parties are serious in implementing health and safety in the project. He remarked that "…client had no involvement…" but he also agreed that the safety record of the contractors submitted during the tendering process has little impact on the selection process because only contractors listed with the council were called to tender and they have approved health and safety records

The Planning Supervisor agreed that the traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stages of design and give some inputs in relation to health and safety of the project; and he slightly agreed that if the selected contractor's tender price is lower that the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.

The safety officer also agreed that the company's safety record has significant influence on the success of the bidding for this project. All sub-contractors and suppliers were given adequate instructions or information regarding your company's health and safety policy to ensure they understand your company's stand regarding health and safety. If the main contractor is involved in the early stages of design e.g. in design-build contract, then the main contractor can give more significant input in the design in respect of health and safety. It was strongly agreed that the client's health and safety policy in this project had significant impact on the overall success in term of health and safety of the project. The safety officer agreed that the implementation of health and safety for this project has a significant impact on the overall cost of the project. However, he only slightly agreed or almost disagreed that in the open tender process the contractor is in dilemma to allocate more money for health and safety because this might jeopardise the chance of winning the tender.

The safety officers from the Health & Safety of the government agreed that the preparation of the Pre-Tender Health and Safety Plan for this project was based on completed drawings and specifications; therefore this helps the contractor to prepare for the health and safety plan for the project in detail, including adequate cost consideration for the health and safety. He strongly agreed that the traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stages of design and give some inputs in relation to health and safety of the project.

Case study 3 (The Putrajaya Precinct 3 Mosque- Malaysia)

The traditional type of contract based on complete design and bills and quantities does not permit any input from the contractor in the design stage. According to the quantity surveyor, the most important criteria are cost and time. Safety issue is deemed to be understood that it is the contractor's job once the project starts. It is important to note the different in this case is the need for all contractors to comply with the Outline Tender Method Statement which at least lay down the client's requirements regarding safety before works start. The contractor welcomes the idea of allowing provisional sum in the contract document so that all contractors will have the same amount of money allocated for safety in the contract.

The contracts between the main-contractor and the sub-contractors are an important tool to ensure that the sub-contractors play their part in the safety issue. The main-contractor is answerable to the client in any incident therefore their contract with the sub-contractors is important so that they are under the direct supervision and control regarding safety.

The process of selecting consultants was done by other government body and according to the consultants the site safety issue is of no significant concern because the consultants are not required to have any safety record or the need to produce any evident that they are well verse about site safety.

The consultants did not see the relationship of the procurement strategy but believe that if an allocation is provided in the contract then it can be useful. To the contractor, the choice of

procurement method is of little significant and the most important is the selection of contractors.

Case Study 4 (The District Police Headquarters of Terengganu-Malaysia)

In the procurement process, there are many opportunities to improve health and safety throughout the project stages. In this case, the design- built, the contractor had the opportunity to come early to contribute any consideration including site safety in the beginning of project conception and design. Even though the contractor has a lot of experiences on the implementation of health and safety, but no opportunities provided by other teams for the contractor to be involved in the design for a safe for construction process. In this case, the selection of the contractor does not take into account of safety record. All team members do not see the contribution the contractor can make during design stage. They were more particular about the structural safety of the building. Therefore although this a design-built project and the opportunity for contractor to give input about site safety in the design stage is available, it is not been utilised. The project was done safely due to the experience of the main-contractor. The choice of procurement method is of little significant in contributing towards site safety according to the main-contractor, the project manager, the architect and the quantity surveyor.

Team integration is critical in promoting safety

Case study1 (Helsby High School Drama and 6th Form Block, Cheshire, England)

The design-build strategy in this case brought all the parties together early in the second stage of tendering where the main contractor and his team of consultants finalize the design to suit the budget requirement of the client. Input from end user regarding safety at the early stages is minimal but all the team members are happy with their contributions during the design stage. The contractor and designer were satisfied with the procurement strategy where their pre-construction safety-plan was looked into and approved before the works started.

The quantity surveyor of the main contractor strongly agreed that the two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage. Further the contractor also agreed that the company's safety record has significant influence on the success of the bidding for this project and the client has great influence on the health and safety issues and provides significant input during the design stage.

Further, the employer agent agreed that the freedom of choice of consultants by the main contractor makes it easier to work as a team in this project. He explained that "...yes...for the contractor. These consultants still have to work with the client's agent..." In addition, he strongly agreed that compared to the traditional type of tendering, the two-stage tendering adopted in this project is more successful in working as a team right from the early stages and this greatly enhances the chance of success in terms of time, quality and cost.

The agent said that he is happy with the teamwork and this is one of the 'smoothest' jobs he has done. The size of the job which is considered small and not complicated also contribute to easy and good teamwork which makes it technically to control safety issues.

In the early stages, the team input can be traced by the risk assessment by the architect working together with the contractor in preparing the pre-construction safety- plan. The Planning Supervisor also has input from other consultants in preparing the safety file of the project. The Council, although a 'passive' client, an important contribution is to ensure that all contractors have been pre-qualified in relation to safety record before they are recommended to the agent for tendering purposes.

When asked about the client's contribution as the leader regarding safety issue, the architect said that he is satisfied with the client's agent and through his Planning Supervisor gave clear instruction, information regarding implementing safety in the project. The architect also commented that it is important to have input from all team members in the design stage.

During the construction period the issue of site safety is an agenda in the site meetings. Through observations, although there is not much issues concerning safety being raised but in the site meetings the school has given some input. Their main concern is the safety of the students and this has been discussed together in the meetings.

The role and contribution by sub-contractors in this project is not that obvious but as stated earlier, the main contractor has a clear policy about safety and they have given all the information regarding safety to the sub-contractors. The site supervisor when asked about the workers comments that sometimes it is quite difficult to convince them the importance of wearing safety helmets and constant monitoring and instructions is necessary. There is a special form to record safety issues on site and a weekly report is made and recorded and presented during the site meetings. Therefore as a conclusion, the team has worked well together regarding safety and they this is more significant during design stage especially in the pre-construction safety plan stage.

The architect agreed that the main contractor has chosen him to be his designer due to long term working relationship. He mentioned that "...our practice has worked well with the contractor in the past and we have had a good understanding of the practices of both companies..." However he agreed a little that the time given for submitting the first proposal during the first stage of tendering was sufficient to consider the health and safety aspects of the project. Further he remarked that "....at first proposal submission the scheme has usually only been considered on its design merit not principally on its safe construction which develops later..."

The architect put high rating that the integration of the team occurred in this project particularly when using the procurement strategy adopted for this project. He mentioned that "...the project has run smoothly throughout its duration largely down to the "integration of the team rather than sets of individuals..." Regarding the client's contribution or input to

assist the architect in the overall success of the project, the architect described that "...they have taken a "back seat" throughout the project. However they have made comments as they have seen the need too. It is quite nice to think they trust the team on this project..."

Case study 2 (Langworthy North–Refurbishment/ of Terraced House UK)

The traditional tendering process introduces the main contractor in the scene only after all design and specifications are ready for tendering. Therefore the contractor has no opportunity to give input at the beginning of design. The contractor was satisfied with the client regarding information needed in order to price the project taking into account safety requirements. The architect, engineer and quantity surveyor in this case come from the same technical department and this is an advantage in terms of teamwork to produce the documents for tendering.

The Pre-tender Safety Plan prepared by the client is crucial this will indicate the level of risk to be undertaken by the contractor. In this case, the designers working with client were not of the opinion that the input from the contractor is not significant because to them this is an ordinary project. The contractor confirmed that enough instructions were given by the client for them to put a realistic cost to include all safety measures for the project. In preparing their construction phase healthy and safety plan which has to be forwarded to the client prior to construction, the contractor did not receive any input from the client which to them is not significant. They also did not receive input from the sub-contractors while preparing the safety plan. The main contractor maintained that they have given adequate instructions

regarding their safety policy to sub-contractors and suppliers so that the latter understand their roles during construction.

The independent safety officer employed by the client insisted strongly that the traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stage of design and to give some input in relation to health and safety. He strongly agreed that the client has an important role to play and in this project, the client overlooked the safety record of the contractor and is shown by the little or no impact on the selection of the contractor.

The architect also agreed that if this was a design build project, the contractor would have more opportunity to give input regarding safety in the design stage and the teamwork would be more significant.

The 'in-house' facility where all the designers are from one department has a positive impact on teamwork to produce design and specification with due considerations on health and safety and this was been verified by the architect and the quantity surveyor for this project. The Principal Designer, the architect and the quantity surveyor all strongly agreed that team integration is vital for better design product and the 'in-house' facility for all the consultants in one department of an organisation makes it easier to achieve the client's objectives. The principle designer described that as the client's agent and the leader of the production team the designer has very significant influence on the overall health and safety of the project. But

he believed that health and safety have little significant impact on the overall cost of the project.

The architect also described that as the client's agent and the leader of the production team the designer has very significant influence on the overall health and safety of the project. Further he believed that health and safety have very significant impact on the overall cost of the project.

The quantity surveyor agrees that team integration is vital for better design product and the in house facility for all the consultants in the client's organisation makes it easier to achieve the client's objectives. The quantity surveyor also agreed that if the project was done using the design-build method, the contractor would have more opportunity to give input regarding health and safety earlier in the design stage and this would minimise problems during the construction stage. Furthermore, he remarked that "...this will depend on client's briefing on H&S requirements as well as in accordance to the current regulations..." Finally he agreed that if the contractor was involved earlier in the design stage through other procurement strategy, e.g. design-build or partnering, the team integration would be more effective.

The Planning Supervisor also greed that team integration is vital for better design product and the in house facility for all the consultants in the client's organisation makes it easier to achieve the client's objectives. However, the principal designer strongly agreed that if the project was done using the design-build method, the contractor will have more opportunity to give input regarding health and safety earlier in the design stage and this would minimise

problems during the construction stage. Finally he agreed that if the contractor was involved earlier in the design stage through other procurement strategy, e.g. design-build or partnering, the team integration will be more effective.

The H & S safety officer slightly agreed on the issue that the main-contractor has strong influence on the commitment of their sub-contractors and in this project the main-contractor has given enough information and instructions to the sub-contractors regarding health and safety. Finally, he slightly agreed that he is satisfied with the site monitoring of health and safety by the site supervisor.

Case study 3 (The Putrajaya Precinct 3 Mosque- Malaysia)

In this case study, team integration is perceived as important issues to bring health and safety on the ground. Team integration was found a key of successful implementation of health and safety throughout project development process. It was found that all parties have same objectives or targets concerning for the project to be success. In this case, it can be seen that all team member assist each other in the implementation of health and safety requirements including regulation and legislation throughout project construction period. The input of design team is seen very important to achieve safe design for improving health and safety on site. Safety meetings and discussions are also held in any stage of the project but safety matters as whole but not site safety which is under contractor's hand.

There is no significant contribution by all parties at the design stage. The input from contractor is also negative at the design stage because of the procurement strategy. All agreed that team integration gives positive impact on safety and only when the project starts the team as a whole is concerned about safety. The leader during construction is the contractor who plays important part in safety and they are proud to be awarded the ISO 1901 in safety management.

Case Study 4 (The District Police Headquarters of Terengganu-Malaysia)

In terms of safety, it is obvious that the team works together after the work starts and the main-contractor as the leader plays a major role to ensure safety. The experienced contractor makes a lot of different and the other team members are happy with the progress. The contractor believes the input of other team members is crucial at construction stage. The understanding between the main-contractor and the sub-contractors is the main criterion for site safety as according to the contractor.

7.2.1 Quantitative verification

In this research, the findings of the case study were cross verified using opinions of the industry stakeholders both in the UK and Malaysia. A questionnaire was sent to selected respondents representing the industry stakeholders using postal survey and direct hand delivery. In the UK, 10 project participants representatives involved in the projects under the case study were asked to complete the questionnaire, while in Malaysia 50 construction companies, clients and other stakeholders were selected to involve in the questionnaire survey. In the case of UK, all the respondents returned back all the questionnaires (100%),

while in the case of Malaysia, only 9 out of 50 respondents (almost 20%) responded to the questionnaire.

As with the purpose of the questionnaire, further analysis of the questionnaire was carried out using descriptive analysis. This analysis is concerned with some issues. The first issue is about the importance of the project participants' position to enhance the construction health and safety. The second issue is about factors affecting an approach to be used by a company to plan and implement health and safety. The third issue is about to what extent that the project participants agree with safety issues related to the construction sectors. The fourth issue is about to what extent that current attempts have been made to improve construction health and safety. The final issue is about to what extent that the project participants have to do to enhance health and safety in construction projects.

Findings of the questionnaire analysis were then used to verify findings of the case study in both countries. Most British respondents have been working on many housing re-development and building maintenance projects, while the Malaysian respondents have been working on many office building and other commercial building projects. Table 7.1 presents project experiences of those respondents. This will assist to identify selected proven respondents for this research.

The number in this table presents the degree of experience with 0 representing none and 3 representing many. The questionnaire survey on the priority of project participants to the implementation of construction health and safety is presented in Table 7.2. The number shows

that 0 is not priority and 3 is high priority. It shows that, in Malaysia, safety officers, design engineers, architects and contracting companies hold high priority role in dealing with safety and health in construction project.

Table 7.1 Project experiences of the project participants

No	PROJECT EXPERIENCES OF THE RESPONDENTS	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	Private residential refurbishment	10	1.11	15	1.5
2	Housing re-development	9	1.00	21	2.1
3	New housing development	15	1.67	17	1.7
4	Office buildings	17	1.89	16	1.6
5	Other commercial buildings	18	2.00	15	1.5
6	Decommissioning / demolition	2	0.22	10	1
7	Building maintenance	1	0.11	20	2
8	Transport infrastructure	5	0.56	0	0
9	Chemical plants	1	0.11	0	0
10	Utilities (water, power)	6	0.67	2	0.2
11	Ports/ harbour	4	0.44	0	0
12	Tunneling	0	0.00	0	0
13	Others	8	0.89	10	1

Table 7.2 Priority of project participants to implement health and safety

No	THE PRIORITY OF PROJECT PARTICIPANTS TO IMPLEMENT CONSTRUCTION SAFETY & HEALTH	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	Clients	27	3.00	28	2.80
2	Design engineers/ architects	33	3.67	35	3.50
3	Contracting company	29	3.22	37	3.70
4	Specialist sub-contractors	27	3.00	30	3.00
5	Principle planning supervisor (Safety Officer)	34	3.78	38	3.80
6	Site-workers / operators	23	2.56	25	2.50
7	Unions	16	1.78	31	3.10
8	Trade associations	17	1.89	29	2.90
9	Professional institutions	28	3.11	38	3.80

7.3 Safety issues in the procurement process

Intra case analysis is to examine the existence of 15 safety issues related to the procurement process as follows:

- Safety policy in the procurement process
- Client's role for enhancing safety culture & practice
- Procurement system effectiveness to promote safety
- Team integration for improving safety practice
- Safety committee for implementing safety
- Incorporating safety into design process
- Safety consideration for selecting contractor
- Safety measurements & documentations for responsibility
- Client representative's commitment on safety
- Safety meeting and coordination
- Safety integration into construction planning & control
- Safety on site requirements
- Safety officer competency
- Safety audit from relevant authorities
- Incident/ accident reporting systems

In this case, the issues may be associated with safety policy that the client imposes within all stages of project procurement process from project conception, project design and project construction. In principle, this analysis is to measure the rating of existence of those issues within each case studied and their comparison between cases as presented in Table 7.3. The

numbers in this table represent the existence scores in which 1 represents non-existence, while 5 represents high existence. This analysis will help to unveil to what extent that the client and other key players can use every stage of the procurement process as a vehicle to enhance safety culture and practices. The rating applied in this analysis was based on findings of interviews with different project participants during the case study.

The case study found that the procurement system for case 1 is design-build, for case 2 is traditional contract. For case 3 is traditional contract and for case 4 is design-build. It can be seen that in term of safety policy, in cases 1 and 2, they have very clear policy, written and implemented because of the imposition CDM regulation, and in case 2, the local authority has also its own safety department. The case 3 is rather unique in Malaysia, because the client has own standard form of contract and safety policy is incorporated in the contract form. However, case 4 does not have own safety policy.

In term of the client's role, for cases 1 and 2, the clients understand the need of CDM compliance and they have implemented it because of the requirement of law. It is difficult to see whether they were concerned with safety and health aspects as the size of project is small. Case 3 is quite unique in the sense that the client was very much concerned about safety issues and imposed it to be implemented on the project development. This is based on the client's own contract form. In case 4, the client was not aware about the importance of health and safety issues.

In term of procurement systems, in case 1 and 2, the whole process of procurement complied with the requirements of the CDM. The safety requirement is embedded in the whole life cycle project until handing over. Case 3 is unique because of they have their own procurement systems and the safety and health is already imposed starting from the beginning. For case 4, safety issues were a matter of concern for the main contractor only.

Table 7.3 Rating of existence of safety issues in the procurement process

NO.	SAFETY ISSUES IN THE PROCUREMENT PROCESS	RATING OF EXISTENCE			
		CASE 1 UK	CASE 2 UK	CASE 3 MALAYSIA	CASE 4 MALAYSIA
01	Safety policy in the procurement process	4/5	4/5	4/5	/5
02	Client's role for enhancing safety culture & practice	3/5	3/5	3/5	0/5
03	Procurement system effectiveness to promote safety	4/5	4/5	3/5	1/5
04	Team integration for improving safety practice	4/5	3/5	3/5	1/5
05	Safety committee for implementing safety	3/5	3/5	3/5	2/5
06	Incorporating safety into design process	4/5	2/5	2/5	2/5
07	Safety consideration for selecting contractor	2/5	2/5	2/5	0/5
08	Safety measurements & documentations for responsibility	4/5	4/5	3/5	1/5
09	Client representative's commitment on safety	4/5	4/5	3/5	2/5
10	Safety meetings and coordination	3/5	3/5	3/5	3/5
11	Safety integration into construction planning & control	3/5	3/5	3/5	3/5
12	Safety on site requirements	4/5	4/5	4/5	4/5
13	Safety officer competency	4/5	4/5	4/5	4/5
14	Safety audit from relevant authorities	4/5	4/5	3/5	3/5
15	Incident/ accident reporting system	4/5	4/5	4/5	4/5

Regarding the team integration, in the case 1, all the team involved in the beginning incorporated safety issues into design process as required by law. It was difficult to identify whether it has real impact related to team integration as the size of the project is small. Case 2 used traditional method, the contractor could contribute more if they were involved in the beginning, but it is a refurbishment project so it does not require extensive design works. In the case 3, this is a traditional contract, the contractor came into the scene later after all the designed has been completed. Although the selection of the contractor did not take into account of the contractor's safety record, the contractor is very keen about site safety and even had an ISO safety certification. The client has a good safety conscious which was reflected in the contract document in relation to site safety. The designers were only concerned with structural safety of the design. In the case 4, team integration was there but it is not focusing on safety issues. However it was rather fortunate that the contractor had very good experience doing projects with oil industry which is very particular about safety and they implemented high standard of site safety for this project.

Regarding the safety committee, in the cases 1 and 2, the committee was not there, however there were safety meetings which were incorporated with the project participants meeting. In the case 3, as it is a big job, there was a proper safety committee and it includes the client's representative. In the case 4, there was a proper safety committee on site under contractor's organization but did not include other participants and the client.

Dealing with the importance of safety in the design process, in the case 1, in the design process, the project participants already included the safety matters as CDM requirement and

the procurement system adopted provides opportunity the contractor to be involved. In case 2, because of traditional system, and it was only a refurbishment project, then safety requirement were not incorporated in the design process. In the case 3, the designer was only concerned with safety of the constructed facilities and safety of construction process was assumed to be under contractor's responsibility. The same goes for case 4.

In the case of safety consideration in selection of contractors, in cases 1 and 2 all listed contractors should have safety records to be considered in tendering process. In the case 3, they did provide safety consideration into selection of contractors. In fact, case 4 did not deal with safety to be considered in the bidding process.

Safety measurement and documents, in cases 1 and 2, they applied safety measurement as required by law (CDM). In the case 3, the client also provided safety as their standard practice. The client introduced safety measurement and documentation. In the case 4, the project did not have certain safety measurements and documents.

In term of client's representative concerns on safety, clients in the cases 1 and 2 were very concerned with safety as law requirements. The client in case 3 had also a very good concern of safety and client's representative had to apply what the client safety policy. In the case 4, the client's representative was less concerned of safety, as the safety was under the contractor's responsibility.

Regarding safety meetings, the project team in the cases 1 and 2 had monthly meeting agenda but not confine to safety matters and the project team in the case 3 had safety meetings as it is a big job, they had safety meeting regularly, however in the case 4, they did not have regular meetings on safety issues only but being incorporated in the regular site meetings.

In the case of safety control and planning, the contractor in the case 1 was very good, and in the case 2 this issue was not obvious as it is a small job. In the case 3, it was good and the contractor obligated the contract requirements. In the case 4, it was very good as the main contractor was very safety conscious. Regarding the safety on site, in all cases, safety on site was all good. They have safety officers registered with authority. Safety audit is also carried by the authority as required by law, in case of Malaysia, it is conducted by the DOSH that comes regularly to site for safety audit. In relation to incident and accident reporting, all projects had a reporting system. However, the UK system is more comprehensive then the Malaysian system.

7.3 Examination of the Established Propositions and Generalisations

In this research, three propositions were established. The case study was then used to verify those propositions. The first proposition is that the greater the involvement of client, in the earlier stages of the production process, the more impact they will give in enhancing health and safety. The second proposition is that procurement is a stronger driver than legislation to enhance health and safety in the industry. The third proposition is that the greater the degree of team integration the better will be the health and safety performance. The first and third

propositions were verified in the case study in the UK only. However the second proposition has not been verified in both case studies in the UK and Malaysia.

Although there is a design-build project procurement studied in Malaysia, no evidence she first proposition exists. The case study of construction projects in the UK shows that as required by law, such CDM regulation, all parties have provided opportunities to utilise their capabilities, roles in enhancing health and safety. The clients have appointed a planning supervisor for more attempts to address health and safety matter during design process. The case study in the UK also found that the contractors had already considered safety matters in their contract as the contractors must provide pre-tender safety plan including risk assessment they made.

It was not found that the procurement is regarded as a better way than legislation to improve the safety culture of all parties in the production process. The research found that the legislation and law enforcement were viewed as an effective instrument to enhance health and safety culture and practice.

In this research, every respondent already quoted that the client has a significant role in delivering a safe construction project. It means that the clients with better leadership quality would result in better management of the health and safety. The client also seen to play the most important role in changing the team's safety culture. The case study in the UK and Malaysia shows almost same view from project participants and the industry stakeholders that

the better the understanding, concern about safety by the client will have great impact on the team's perception on health and safety.

In order to verify the third proposition, the case study both in the UK and Malaysia pursued the perception and opinion from the project participants and the stakeholders on the issue of team integration's impact on health and safety. Their views describe that good team integration right from the early stage of the production process would produce better health and safety management. The word 'team' means all the parties, the client, the designers, planning supervisor, contractor, sub-contractors and suppliers. The real challenge in the production process is to draw all the team to have the same objective, understanding, perception about health and safety. Team integration also means looking into the partnering concept not only between the client and contractor but also contractor and sub-contractors and suppliers.

7.4 The Rate of Safety Concern

In UK, as with CDM regulation mentioned, principal planning supervisor and contracting company also hold priority role in enhancing health and safety practice. However, in UK professional institutions are also regarded as the influential stakeholder to promote health and safety as well. It can be seen that in both countries, those project participants have been seen as the project participants who directly deal with safety and health rather than clients and trade association or trade union. Table 7.4 shows the finding of the survey on factors affecting an approach taken by a company on delivering health and safety. In this table, the number shows the degree of influence of the factors toward the approach. In this case, 0 is assigned

for no influence and number 3 is assigned for strong influence. In both countries, legal and insurance requirements are still the most influential factors affecting the implementation of health and safety in construction. It means that statutory requirement become an important instrument to enhance health and safety in practice. On the other hand, union demands and employee wishes are included as less affecting factors.

Table 7.4 Factors affecting a company approach on health and safety

No	FACTORS AFFECTING APPROACH ON HEALTH AND SAFETY BY A COMPANY	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	The specification of the job	21	2.33	26	2.60
2	Legal requirements	25	2.78	28	2.80
3	Health and safety practices of competitors	19	2.11	20	2.00
4	Requirements from professional bodies or trade Associations	23	2.56	23	2.30
5	Views of the Company Directors	21	2.33	25	2.50
6	Union demands	15	1.67	19	1.90
7	Employee wishes	17	1.89	19	1.90
8	Insurance requirements	24	2.67	28	2.80
9	Owners/shareholders/investors	23	2.56	19	1.90

7.5 The Significant Differences of Health & Safety Implementation

Table 7.5 describes the degree of agreement by the industry stakeholders regarding the safety statement related to the implementation of health and safety in construction. In this table, 0 represents strongly disagree and number 6 represents strongly agree. Findings of the survey on the industry stakeholders show that in the UK, partnership has been regarded as a good deal to the implementation of health and safety in construction. Table 7.5 shows that (i) site managers should have a very good understanding of health and safety; (ii) client representatives should convince the client about the importance of H & S so that the client is ready to invest more in H&S, (iii) Planning Supervisors/ safety officers help to improve health and safety were regarded as the most important attempts to promote health and safety. It is almost similar in Malaysia as the industry stakeholders also quoted that those attempts can drive the implementation of health and safety more rigorous. However, the issue of partnership was also quoted as a good driver as shown in Table 7.5. In this table, (i) a co-operative relationship between client and lead contractor is critical to good health and safety management and (ii) The attitude of the leader in the production team will have significant impact on the safety culture of the whole team in a project. It was also found that the Malaysian stakeholders strongly disagreed that (i) architects, engineers and quantity surveyors have nothing to gain from being fewer accidents, and (ii) The division of tasks between designers, contractors, etc. makes it difficult to manage health and safety.

Table 7.5 the degree of agreement by the project participants to the statement below

No	THE DEGREE OF AGREEMENT BY PROJECT PARTICIPANTS TO THE STATEMENTS BELOW	CASES			
		MALAYSIA		UK	
		Total	Ave. Score	Total	Ave. Score
1	The construction sector believes its safety performance is satisfactory	31	3.44	30	3.00
2	The health and safety problems inherent in construction activities make it difficult to improve health and safety performance	30	3.33	25	2.50
3	Professional qualifications for engineers/designers/architects/quantity surveyors help to deal with real health and safety issue	31	3.44	41	4.10
4	Qualification for building trades cover health and safety thoroughly	24	2.67	33	3.30
5	Existing law and regulations clearly define health and safety requirements	38	4.22	46	4.60
6	Companies in the construction sector consider their health and safety performance to be important to commercial success	23	2.56	45	4.50
7	Large firms take health and safety more seriously than small firms	36	4.00	43	4.30
8	The costs of managing health and safety are too great for small and medium sized companies	20	2.22	28	2.80
9	Companies do not seriously prevent health and safety incidents because they rely on insurance policies to cover claims	27	3.00	14	1.40
10	When construction work is scarce, health and safety is cut back like other costs, so as to keep competitive	29	3.22	32	3.20
11	Keeping competitive means companies can't effort to invest in health and safety training	22	2.44	21	2.10
12	Most projects have short or inadequate schedules which have negative impact on health and safety	16	1.78	32	3.20
13	The sooner the client appoints the principle contractor the safer the project will be	34	3.78	47	4.70
14	Working constantly with the same set of contractors/ sub-contractors etc. improves health and safety performance	33	3.67	51	5.10
15	Architects, engineers and quantity surveyors have nothing to gain from being fewer accidents	12	1.33	17	1.70
16	The division of tasks between designers, contractors, etc. makes it difficult to manage health and safety	8	0.89	24	2.40
17	The cost of improving health and safety performance exceeds the benefits to be gained	15	1.67	18	1.80
18	The construction industry is unique, and you can't use health and safety management methods tried in other industries	18	2.00	25	2.50
19	Spending money on managing construction health and safety saves money on the long run	41	4.56	39	3.90
20	Partnering' can improve construction health and safety	40	4.44	44	4.40
21	The specification from the client determines how well health and safety is managed on the project	43	4.78	33	3.30
22	A co-operative relationship between client and lead contractor is critical to good health and safety management	49	5.44	48	4.80
23	The size and complexity of the project (e.g. no. of sub-cons) influences how well health and safety is managed	29	3.22	38	3.80
24	The health and safety of high profile projects are always well managed	33	3.67	41	4.10
25	Method statements do not include sufficient information on how to do the job safely	34	3.78	28	2.80
26	It is difficult to manage safety if there are too many changes to the plan of work	18	2.00	34	3.40
27	Project with severe budget pressures will be unsafe	29	3.22	34	3.40
28	A project that runs into schedule pressures will pay less attention to health and safety	25	2.78	41	4.10
29	A project with a large number of self-employed workers is likely to have more accidents	24	2.67	39	3.90
30	The more experienced the management team, the better will be the health and safety of the project	34	3.78	48	4.80
31	The more experienced the work force, the better will be the health and safety of the project	44	4.89	47	4.70
32	Planning Supervisors/ safety officers help improve health and safety	43	4.78	53	5.30
33	It is possible to foresee and remove health and safety problems during the design and planning stages	33	3.67	50	5.00
34	It is possible to foresee and remove health and safety hazards to workers from the construction drawings and schedule of work	36	4 00	46	4 60
35	Designers leave it to others to find safe ways of constructing their design	27	3.00	33	3.30
36	Design changes or changes to the plan of work, during construction create safety problems	28	3.11	45	4.50
37	All health and safety problems that occur during construction can be resolved on site	32	3.56	35	3.50
38	Site managers look out for health and safety problems and are quick to correct them	35	3.89	47	4.70
39	The attitude of site managers to health and safety is dependent on the attitude of their senior management	44	4.89	47	4.70
40	Supervisors/foremen ensure their workers are working properly	35	3.89	46	4.60
41	Workers know more about safety than management	21	2.33	19	1.90
42	It is difficult to convince sub-contractors to work safely	21	2.33	36	3.60
43	Self-employed workers are more at risk than others	25	2.78	38	3.80
44	Site managers should have a very good understanding of health and safety	49	5.44	56	5.60
45	Client representatives should convince the client about the importance of H & S so that the client is ready to invest more in H&S	51	5.67	55	5.50
46	It takes an accident to occur on a project before health and safety is taken seriously	34	3.78	25	2.50
47	The only reason for writing health and safety rules and manuals is to satisfy legislation	31	3.44	18	1.80
48	An in -experience client does not understand the importance of health and safety to the overall success of the project	39	4.33	49	4.90
49	Design-build project gives better chance for all parties to seriously thought about H&S of a project in the early design stage	28	3.11	41	4.10
50	The attitude of the leader in the production team will have significant impact on the safety culture of the whole team in a project	47	5 22	52	5 20
51	Construction workers accept that poor health and safety conditions are part of the job	32	3.56	26	2.60
52	Attitudes of workers to health and safety are strongly influenced by their training / qualification	42	4.67	48	4.80
53	The construction industry does not about the long term health f its workers	28	3.11	23	2.30

7.6 The Issues of Safety in the Procurement

Table 7.6 shows that the degree of change regarding health and safety in the industry as perceived by the industry stakeholders. In this table, number 0 represents large worsening, number 3 represents no change and number 5 represent large improvement. Findings of the survey show that in the UK, (i) level of co-ordination on health and safety within project, and (ii) acceptance of responsibility by management, (iii) Health and safety in planning construction activities, and (iv) Enforcement of health and safety rules have changed, while it was also found in Malaysia. However, acceptance of responsibility by management was still assumed as a management of contracting company, rather than management of project organisation involving all parties.

Table 7.7 describes the degree of change on the understanding of project participants on health and safety in the construction industry. In this table, number 0 represents large worsening, number 3 represents no change and number 5 represents large improvement. The survey found that in the UK planning supervisors, site managers and site supervisors have large improvement of their understanding on the issue, while in Malaysia, designers / consultants and safety officers have also large improvement of their understanding. However, the client and construction workers in both countries have no change in their understanding on health and safety.

Table 7.6 the degree of change regarding health and safety in the construction industry

No	THE DEGREE OF CHANGE REGARDING H & S IN THE CONSTRUCTION INDUSTRY	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	Level of co-ordination on health and safety within project	32	3.56	45	4.50
2	Acceptance of responsibility by management	35	3.89	44	4.40
3	Involving main contractors in the early design stage e.g. design-build	31	3.44	31	3.10
4	Degree of worker consultation (in site practices)	29	3.22	38	3.80
5	Health and safety in planning construction activities	32	3.56	45	4.50
6	Reporting of accidents	31	3.44	43	4.30
7	Client involvement	31	3.44	38	3.80
8	Enforcement of health and safety rules	33	3.67	45	4.50
9	The health and safety and well-being of construction workers	30	3.33	40	4.00

Table 7.7 the degree of change on the understanding of project participants on health and safety

No	THE DEGREE OF CHANGE ON THE UNDERSTANDING OF PROJECT PARTICIPANTS ON H & S IN THE CONSTRUCTION INDUSTRY	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	Clients	32	3.56	39	3.90
2	Designers/ consultants	36	4.00	43	4.30
3	Planning Supervisors (UK Only)/ Safety Officer (M)	39	4.33	46	4.60
4	Head -office Managers	34	3.78	40	4.00
5	Project Managers	32	3.56	43	4.30
6	Site Managers	35	3.89	44	4.40
7	Site Supervisors	34	3.78	44	4.40
8	Construction Workers	28	3.11	36	3.60

7.7 The Commitment of The Project Team

Table 7.8 shows that attempts have proposed to benefit on the implementation of health and safety. In this table, number 0 represents could worsen, number 2 represents no benefit and number 4 represents big benefit. It was found that in the UK, more use of partnering/ allowancing arrangement and more health and safety training courses were perceived as beneficial attempts, while in Malaysia, (i) more effort into planning a project before construction and (ii) Best Value for Money concept rather than lowest cost were perceived as the biggest benefit for improving health and safety in the industry. This research also investigated any change in the number of accidents, proportion of project allocation on health and safety as well as regulations and enforcement. Table 7.9 exhibits that in the UK, the health and safety regulation and enforcement by authority have increased largely, while it is also similar in Malaysia. However, the number of fatalities and major accident in both countries has only slightly changed to some degree. In this table, number 0 represents large decrease, number 3 represents no change, and number 5 represents large increase.

In this research, to what extent the scope that those project participants have improved health and safety performance in construction was also discovered. In this survey, number 0 represents no scope and number 3 represent large scope. Table 7.10 describes that in the UK, most project participants have contributed to some scope to large scope of improvement, while in Malaysia only government, and safety inspector/ officers have contributed to large scope. On the other hand, other project participants have only contributed some scope of improvement. It also found that in Malaysia, trade associations and construction workers have

less contribution to the health and safety improvement as they are mostly foreign workers with no working experiences at all.

Table 7.8 The degree of benefit in improving health and safety in the construction industry

No	THE DEGREE OF BENEFIT TO IMPROVE HEALTH & SAFETY IN THE CONSTRUCTION INDUSTRY	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	More use of partnering/ alliancing arrangement	25	2.78	31	3.1
2	More effort into planning a project before construction	31	3.44	38	3.8
3	More time during construction to assess health and safety issue	30	3.33	36	3.6
4	More health and safety training courses	29	3.22	37	3.7
5	More health and safety input for professional courses in an institution of higher learning	28	3.11	35	3.5
6	More pre-fabrication materials for projects	25	2.78	27	2.7
7	Greater penalties	30	3.33	32	3.2
8	Prosecution of Directors	29	3.22	33	3.3
9	Corporate manslaughter	29	3.22	30	3
10	Best Value for Money concept rather than lowest cost	31	3.44	33	3.3
11	Clearer regulations	29	3.22	31	3.1

Table 7.9 the degree of change regarding health and safety in the construction industry

No	THE DEGREE OF CHANGE REGARDING H & S IN THE CONSTRUCTION INDUSTRY	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	Number of fatalities/ major accidents	22	2.44	21	2.10
2	Proportion of project allocation for health and safety	24	2.67	40	4.00
3	Health and safety regulations	34	3.78	45	4.50
4	Site enforcements by the authority	33	3.67	43	4.30

Table 7.10 the degree of improvement by the project participants on health and safety in the industry

No	THE DEGREE OF IMPROVEMENT BY THE PROJECT PARTICIPANTS ON HEALTH & SAFETY IN THE CONSTRUCTION INDUSTRY	CASES			
		MALAYSIA		UK	
		Total	Average Score	Total	Average Score
1	Government	22	2.44	28	2.80
2	Clients	21	2.33	24	2.40
3	Contract Management	21	2.33	25	2.50
4	Inspectors	22	2.44	27	2.70
5	Designers/consultants/planning supervisors	20	2.22	26	2.60
6	Project managers	19	2.11	26	2.60
7	Site managers	21	2.33	28	2.80
8	Safety advisors	21	2.33	28	2.80
9	Supervisors/ foremen	21	2.33	28	2.80
10	Construction workers	18	2.00	27	2.70
11	Professional institutions	19	2.11	22	2.20
12	Trade associations	14	1.56	20	2.00
13	Insurers	18	2.00	24	2.40

7.8 Project Participants' Important Role

The importance of project participants to the construction health and safety are described below. Figure 7.1 shows that participants involved in the successful of health and safety implementation and their important role.

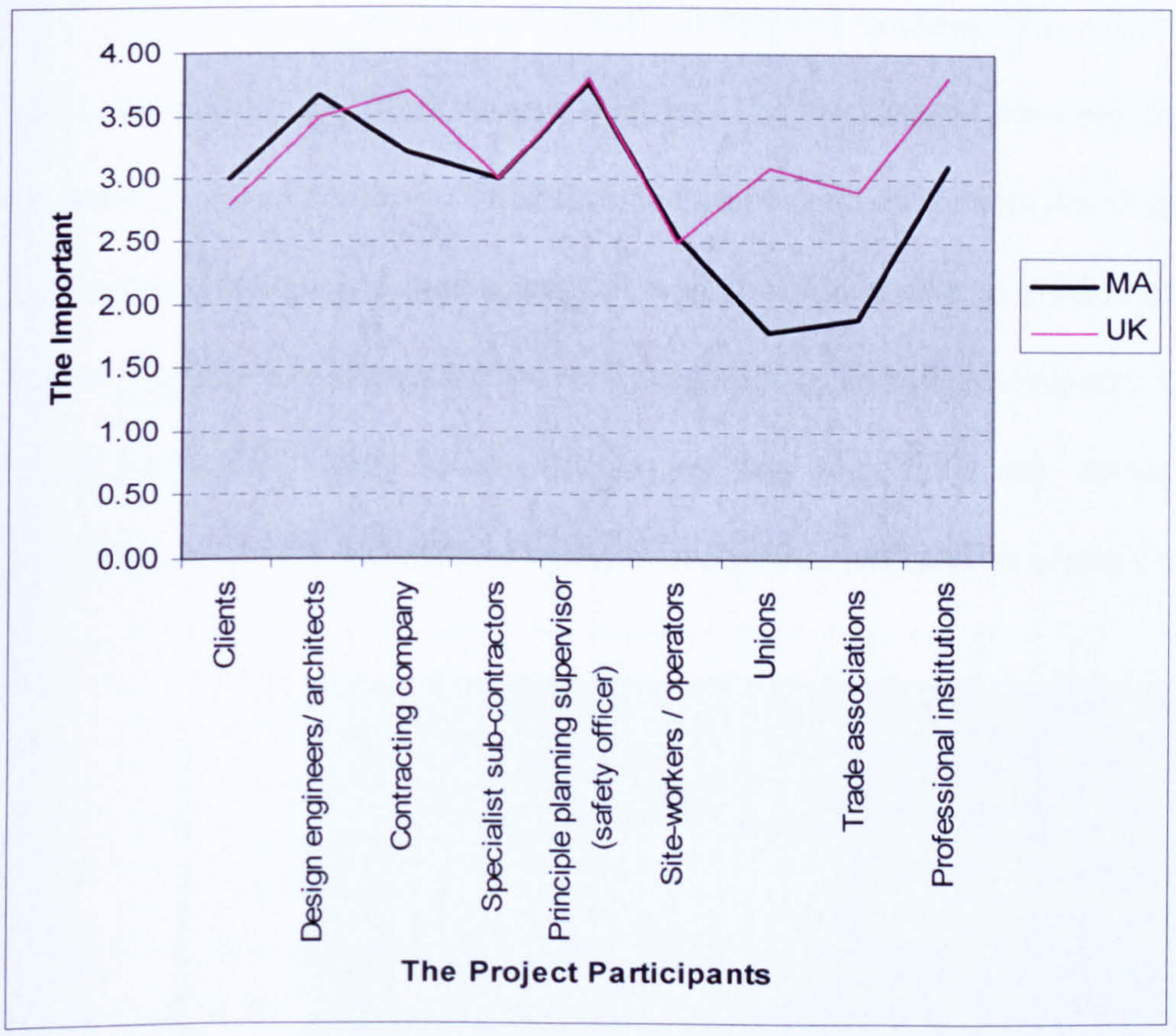

Figure 7.1 Project participants' important level

The important score is from 0 to 4 representing priority level of project participants to improve health and safety in construction. Score 0 is not priority at all while 4 is high priority for improving health and safety. The comparison between the UK and Malaysia shows that most project participants particularly those who are directly involved in construction projects are important for improving health and safety in construction. In these two countries, principal

planning supervisors or safety officers are the most important party for construction health and safety. However, the contracting companies in Malaysia are less important than in the UK. Furthermore, those who are indirectly involved such as unions and trade associations as well as professional institutions in Malaysia are less important compared to UK counterpart. In Malaysia, construction workers are mostly immigrant coming from other countries like Indonesia, Bangladesh and other Asian Countries. The workers are not working under unions or trade associations of Malaysia. Therefore, the unions and trade association are not regarded as important as other project participants. It was also found that in professional institutions such higher learning institutions are not really regarded as an indirect important participant for improving health and safety in construction as they may have any strong curricula for capacity building of their members or students in construction health and safety.

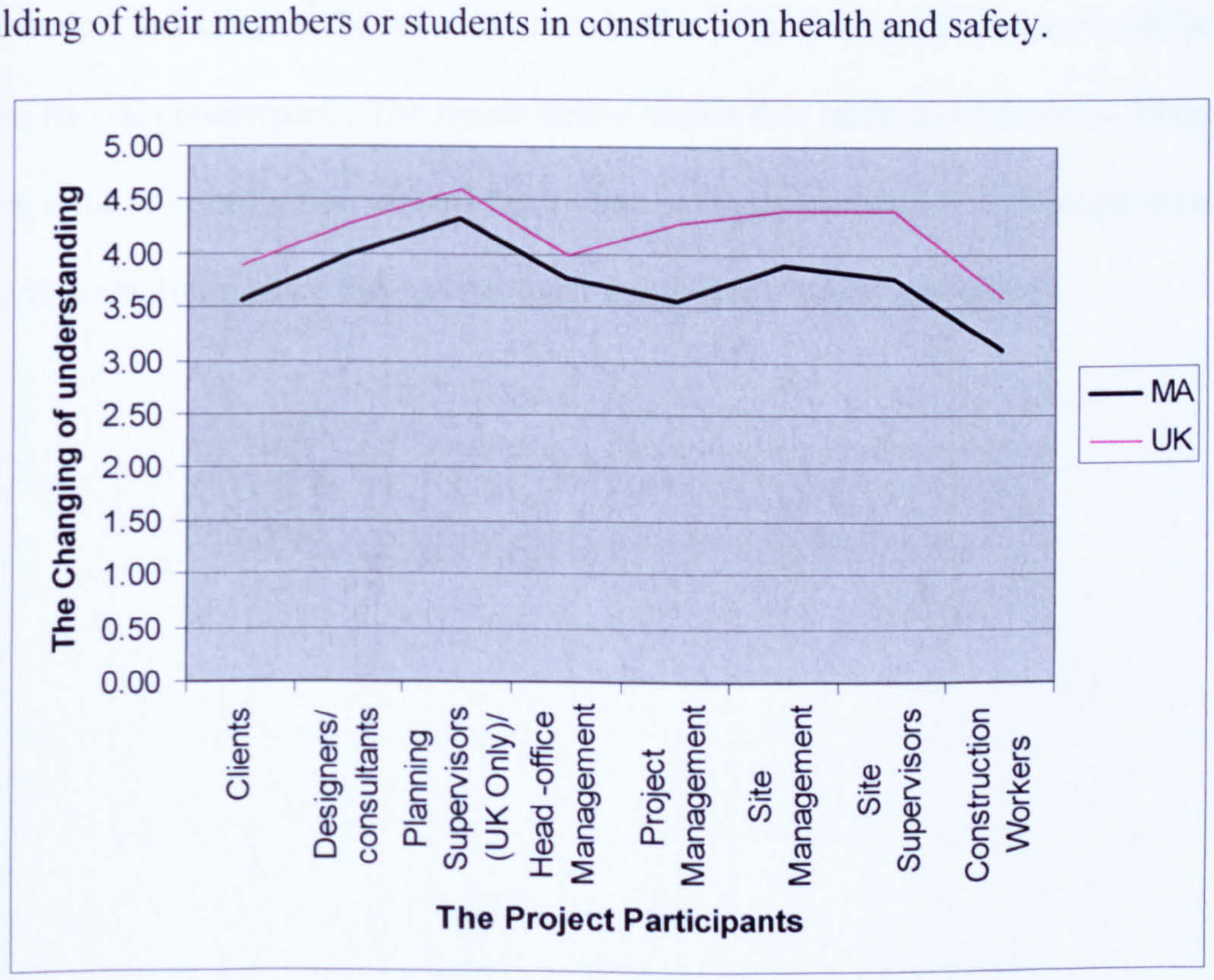

Figure 7.2 Project participants' changing of understanding

The figure 7.2 describes that only safety officers in Malaysia have changed their understanding towards health and safety. However, construction workers in Malaysia only have a little changing of understanding. This may due to the fact that most construction workers are immigrant who have little competency of health and safety practices. In the UK, most project participants have really better understanding on health and safety.

It was also found that each project participant may have different level of contribution on scope of health and safety improvement. Figure 7.3 describes the different participants have different contribution towards safety in construction. In the UK, it was believed that project participants have higher contribution of improving health and safety in every level of project delivery. However, in Malaysia the level of contribution of project participants is still below as opposed to its UK counterparts. The figure below shows that trade association in Malaysia does not have a lot of contribution toward health and safety in construction. Foreign workers may result in this condition since they do not need to involve as trade association.

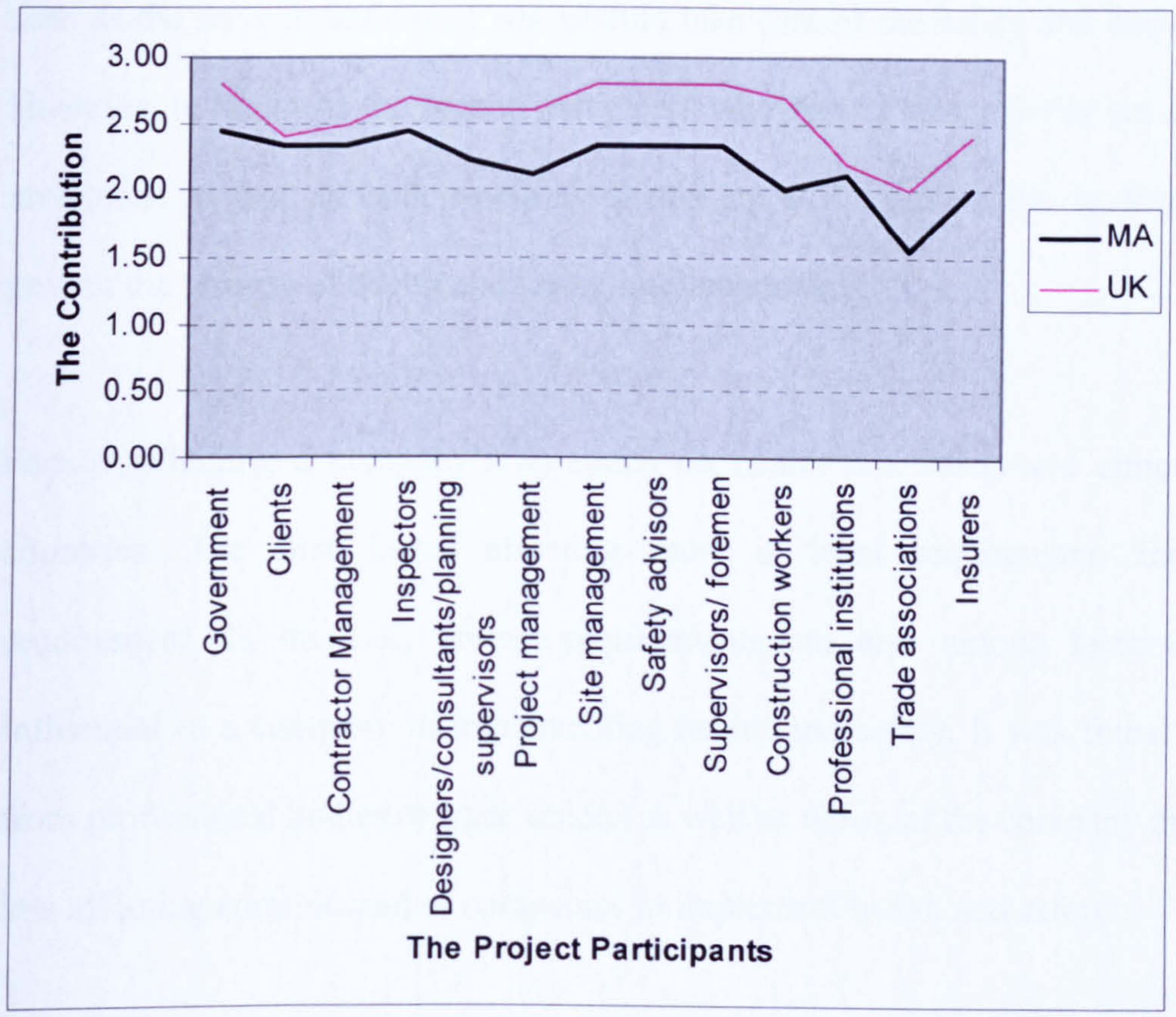

Figure 7.3 Project participant's contribution

In the case of Malaysia, government and safety inspector are project participants having highest contribution to the construction health and safety practices. It is really dealt with the law enforcement and in particular pushing site safety under law.

The cross-case analyses have found some differences with regard to safety practices between the Malaysian and British Construction Industries. It was found that in both countries, principal planning supervisors or safety officers are regarded as project participant who have highest priority in dealing with health and safety implementation. In the UK, although CDM Regulation has imposed the designers to contribute more to safety, contracting companies are

seen as the second participant who should take care of the safety and health implementation. However, in Malaysia the second participant who should have priority are design engineers or architects. In fact, in both countries clients are still far from the leading participants who govern the priority of health and safety implementation.

Factors affecting a company's approach on health and safety are almost similar in both countries. The first factor affecting most is legal requirement, including insurance requirement. In the UK, project requirements are also among factors which are most influential to a company in implementing health and safety. It was found that requirements from professional bodies or trade unions as well as views of the company directors are factors less affecting commitment of companies to implement health and safety.

It is quite interesting in both countries that committed project participants are the most influential factor for the implementation of health and safety in the construction industry. It was found that client's representatives and site managers and the leaders of production team will have significant impacts on the implementation of health and safety on site. In the UK, it is believed that partnering is the most important way of improving health and safety practices. As with CDM regulation, in the UK the role of planning supervisors and efforts during planning and design of the project will improve safety practices. In both UK and Malaysia, the attitude and committed leader including clients or client's team will have significant impact on safety practice of the whole team in the project procurement.

In the UK, issues related to health and safety practices have changed significantly compared to Malaysia. Level of coordination on health and safety during procurement process among project participants are higher. Besides that, acceptance of responsibility by management, health and safety in planning construction activities, as well as enforcement of health and safety rules are much higher in the UK. It was also found that client involvement in term of health and safety in the UK is higher than Malaysia. Overall, understanding of project participants about health and safety in the UK is also better than in Malaysia. In Malaysia, construction workers are among project participants who have less understanding on health and safety as mostly they come from foreign countries where safety rules are less concerned with.

The cross case analysis also found that there are some benefits in improving health and safety through procurement process, client leadership and project team integration. Best value for money concept rather than lowest cost is believed to benefit in improving health and safety practice. Furthermore, more effort into planning a project before construction, more health and safety training courses and more time during construction to assess health and safety issue will improve much higher in safety and health practice in the construction industry. All these issues can be seen in Figure 7.4 below.

It is quite different in both countries regarding the change of health and safety in the industry. In the UK, there is significant changing, such as number of accident is lesser, proportion of project allocation for health and safety is higher, and health and safety as well as site enforcement by authority are imposed better. In overall, the project team integration and

commitment for health and safety practices in the UK is much higher than Malaysia. Some improvement factors described in Figure 7.4 below shows the level of change.

A: More use of partnering/ alliancing arrangement

B: More effort into planning a project before construction

C: More time during construction to assess health and safety issues

E: More health and safety training courses

F: More health and safety input in professional courses

G: More pre-fabrication materials for projects

H: Greater penalties

I: Prosecution of Directors

J: Corporate manslaughter

K: Best value for money concept rather than lowest cost

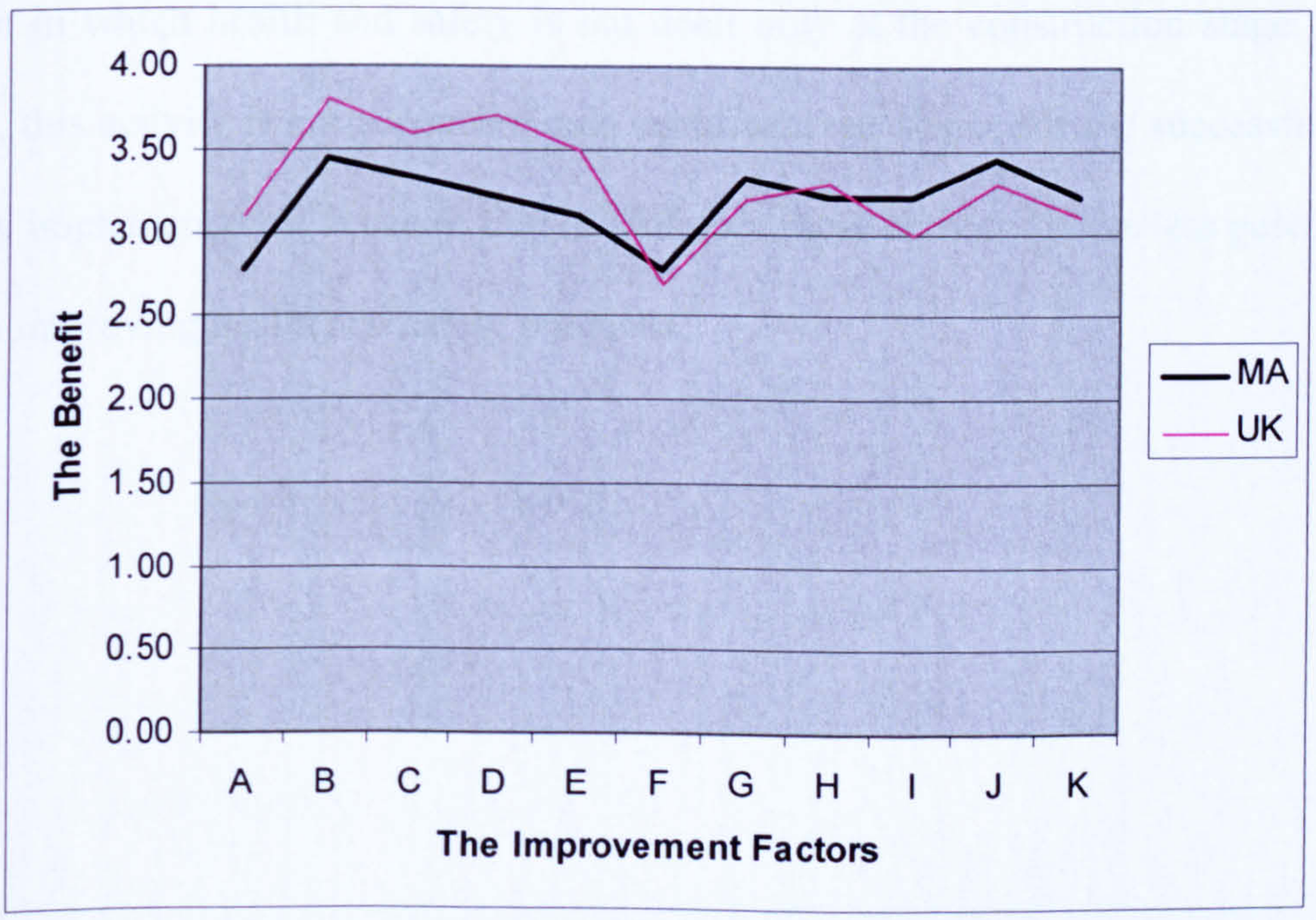

Figure 7.4 Improvement factors benefiting to improved health and safety.

The cross case analysis has presented findings by way of comparisons. It is believed that the case studies concerned were not quite different to draw conclusions from comparison analysis of the findings. It is justifiable since existing criteria and selection of the case study objects. It was expected that client leadership, project team integration reflected by highest commitment during project procurement for implementing safety practice are evidence of greater benefits.

There are also some differences of project participants' perception on how activities of procurement process may help improve health and safety practice. Figure 7.5 shows that the activities both pre-construction and during construction can improve health and safety performance. In the case of the UK, those activities were perceived higher rate to assist the successful of health and safety implementation compared to the case of Malaysia. In particular, preparation of pre-tender health and safety plan in the UK was regarded the highest rate to assist the improvement of health and safety practices. It is in line with the CDM regulation in which health and safety is not dealt only at the construction stage. In fact, in Malaysia, this activity is not accounted as a significant assistance for the successful of health and safety implementation. It seems that in Malaysia those activities were less perceived to be helpful in improving health and safety practices.

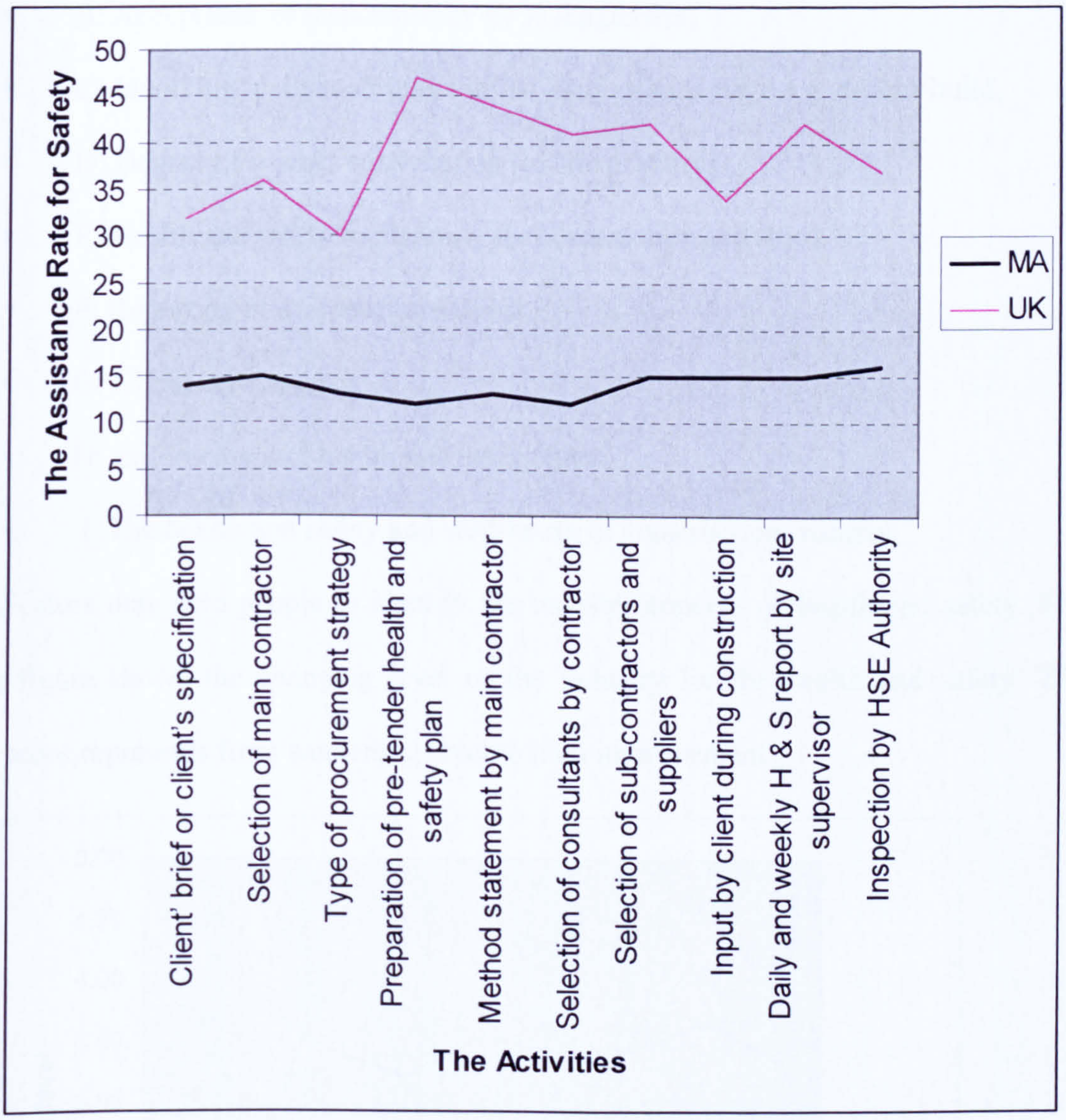

Figure 7.5 Activities and their contributions for successful health and safety

7.9 Changing of Health and Safety Nature

The research was also concerned with how health and safety in the construction industry has changed progressively in both countries. The following indicators represent the changing of the industry towards health and safety.

- A: Level of co-ordination on health and safety within projects,

- B: Acceptance of responsibility by management,
- C: Involving main contractors in the early design stage e.g. design-build,
- D: Degree of worker consultation (in site practices),
- E: Health and safety in planning for construction activities,
- F: Reporting of accident causations,
- G: Client involvement,
- H: Enforcement of health and safety rules,
- I :The health and safety and well-being of construction workers,

Those indicators may help people to identify the industry concern of health and safety. The following figure shows the changing level of the industry for the health and safety. The changing score represents from worsening level to high improvement.

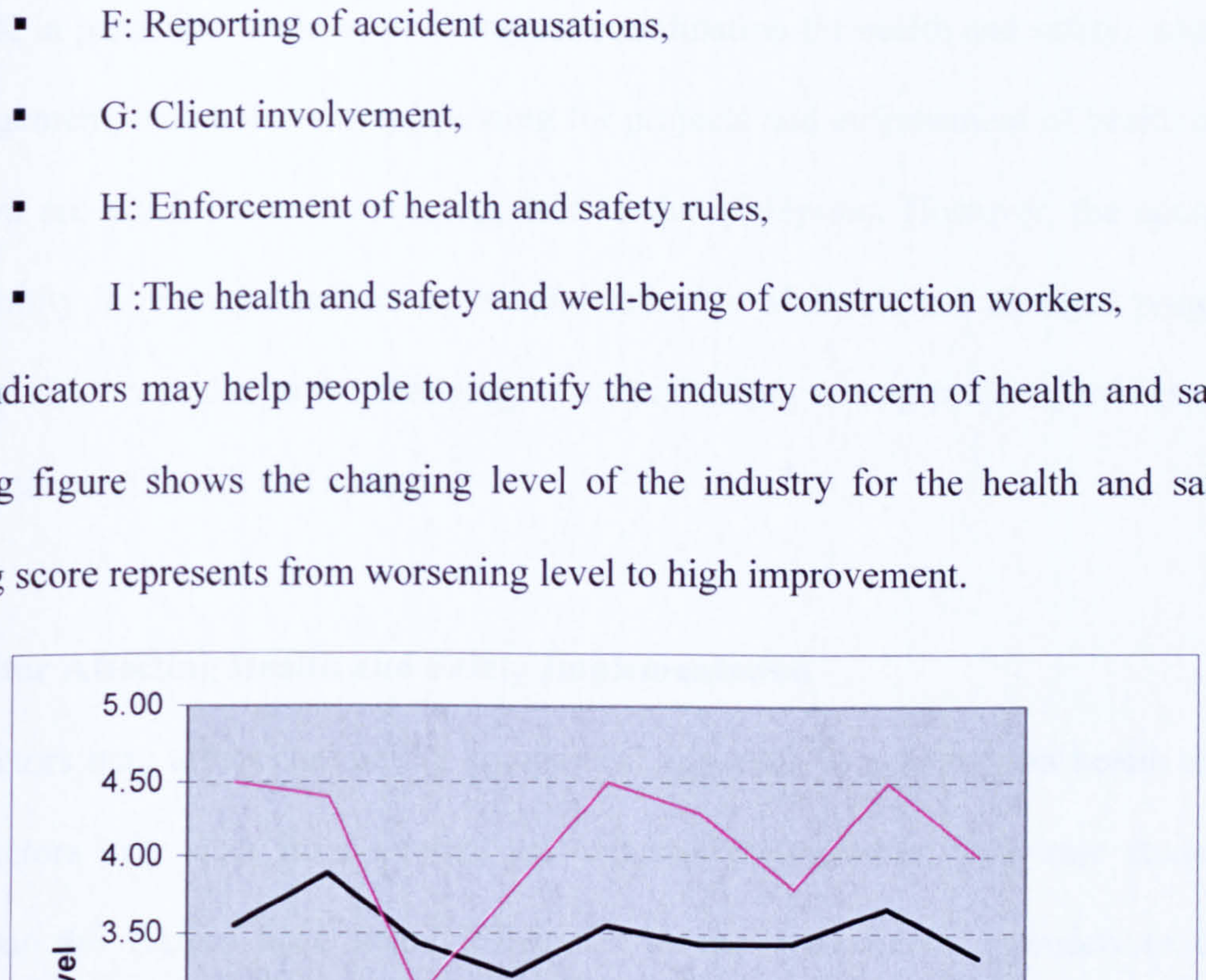

Figure 7.6 Changing of safety improvement factors

This figure 7.6 shows that the involvement of main contractors in the early design stage for promoting better safety consideration during design does not improve significantly in both countries. Separation between design and construction is still common practice in the industry. Consultation with construction workers on site practice has also less changing level. In the UK in particular the level of change of coordination for health and safety, responsibility of management, health and safety planning for projects and enforcement of health and safety regulation are much better there as opposed to the Malaysian. However, the acceptance of responsibility by management on health and safety in Malaysia has changed progressively. This may also occur due to the changing of understanding among project participants toward the importance of health and safety.

7.10 Factor Affecting Health and Safety Implementation

Many factors may affect contracting companies' approach to construction health and safety. Those factors may stem from internal and external organization. This case study analysis found that the factors have some influences to the companies' approach to deal with construction health and safety. The following figure shows the influence level of factors affecting the companies' approach.

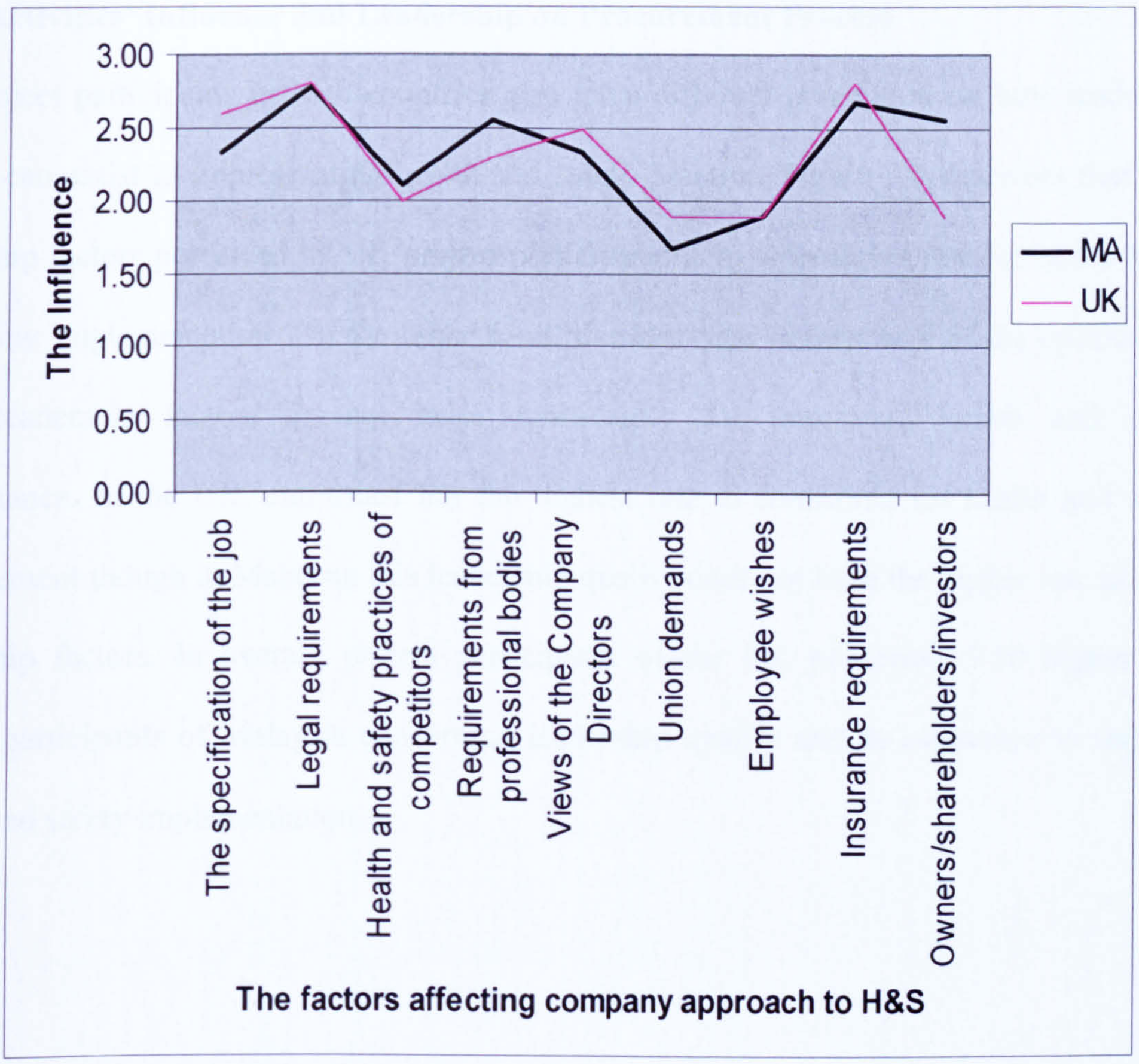

Figure 7.7 Factors affecting company approach

In this figure 7.7, the degree of influence reflects how strong the factors have affected contracting companies' approach to deal with construction health and safety in both countries. The graph shows both countries have similar or identical characteristics of factors affecting companies' approach. It can be seen that legal requirements and insurance requirements are among highest affecting factors to companies' approach. In fact, union demands and employee wishes are not fully regarded as higher affecting factors. It follows that unions and trade association are not really important parties for construction health and safety.

7.11 Activities' Influence and Leadership on Procurement Process

The project participants in both countries also have different perception on how leadership quality can assist in implementing health and safety practice. Figure 7.8 describes that most leadership factors perceived by UK project participants help with higher rate for better health and safety implementation. On the other hand, the Malaysia project was of the opinion that those leadership factors do not help significantly for improving health and safety performance. In the UK, enthusiast has the highest rate to contribute for health and safety improvement though in Malaysia this leadership quality does not have the higher rate as other leadership factors. In overall, project participants of the UK perceived 5-10 higher than project participants of Malaysia concerning leadership quality and its assistance to improve health and safety implementation.

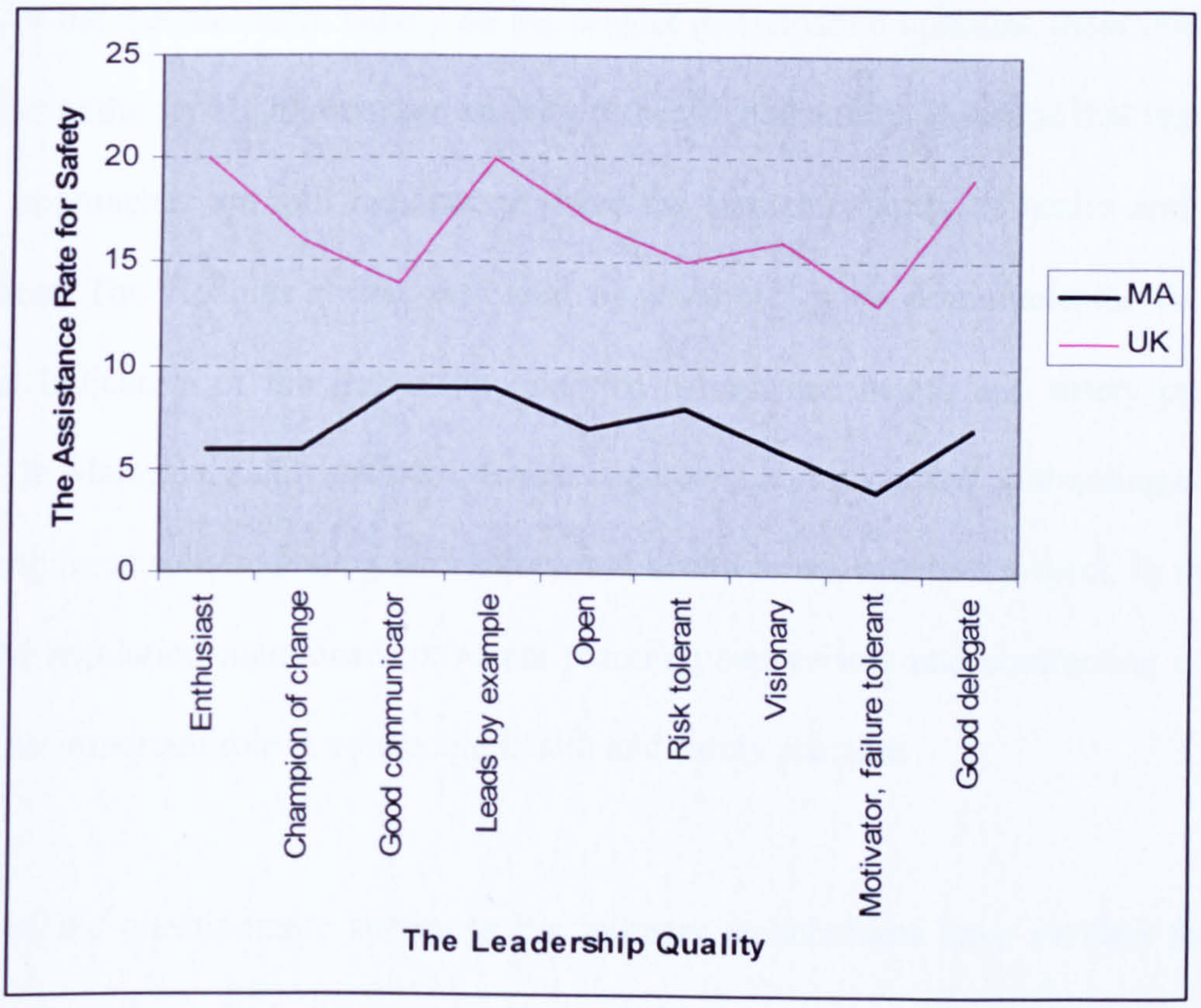

Figure 7.8 Leadership and assistance to health and safety

7.12 Generalisations and conclusions

Chapter 7 has presented findings of intra case analyses. This chapter has shown findings of cross case analyses in the form of comparisons. It can be drawn that as UK is a fully developed country, procurement process has been used to enhance safety practice in the construction industry. The CDM regulation has provided an effort to bring all parties involved in the building procurement to take care of safety and health since the beginning of the project.

Findings of the questionnaire survey on the project participant's opinions show inspection or safety audit authority is an important activity to health and safety. It means that regulation or statutory approaches are still required to drive the implementation of health and safety in construction. The findings reveal that lead by example, good communicator is the most influential indicators of the leadership qualities to enhance health and safety culture and practices. In Malaysia, safety officers, design engineers/ architects and contracting companies hold an important role in dealing with safety and health in construction project. In the UK, as with CDM regulation mentioned, principal planning supervisors and contracting companies also hold an important role in enhancing health and safety practice.

Findings of the questionnaire survey to the industry stakeholders have verified the project participants' opinions. In both countries, legal and insurance requirements are still the most influential factors affecting the implementation of health and safety in construction. It means that statutory requirement become an important instrument to enhance health and safety practices. Partnership has been regarded as a good deal to the implementation of health and safety in construction. Other issues were also found such as, site managers should have a very good understanding of health and safety; client representatives should convince the client about the importance of H & S so that the client is ready to invest more in H&S, and planning Supervisors/ safety officers help to improve health and safety are regarded as the most important attempts to promote health and safety. In the UK, most project participants have contributed to some scope to large scope of improvement, while in Malaysia only government and safety inspectors/officers have contributed to large scope. The first and third propositions

of this research were verified in the case study in the UK only. However the second proposition has been verified in both case studies in the UK and Malaysia.

CHAPTER 8: DISCUSSIONS AND IMPLICATIONS

8.1 Introduction

The triad of cost, time and quality achievement has been known as a fundamental objective of the project procurement management. Many key players of construction project development have attempted to pursue a smart project management system for completing their project within budget, on time and quality proven. However, current trends on managing construction project have included safety and health as part of the objectives. Safety and health has become one of performance indicators of construction project effectiveness monitoring and evaluation (Sinthawanarong, 2000). Safety and health is not only viewed as a matter of production process on the ground, but also planning process (Saurin et al, 2004; Cameron et al, 2004).

This research deals with identification of safety practices in the project procurement process in the UK and Malaysia. It focuses on the effectiveness of procurement strategies, client leadership and team integration which will potentially improve the performance of health and safety implementation. This chapter describes lessons learned from the case studies and discusses the findings of the research associated with improvement of safety and health in the procurement process. The lessons learned deals with how project participants and the industry stakeholders' opinions in improving safety and health through the procurement process. As the client is the leader of the procurement process, the client leadership is also discussed. From the research findings, improving procurement process in relation to enhancement of health and safety is also elaborated. As with the procurement process involves many different

parties with different tasks, the team integration for health and safety is then highlighted. Finally, the need for safety framework as a tool to deliver safety and health along with time, cost and quality during the procurement process is introduced. This may assist in enhancing safety and health culture and practice in construction.

8.2 Client Leadership

In order to bring about cultural changes in the industry, good leaders are essential. Good leaders have a clear vision of where they are going and communicate that vision positively to other in the organisation. If leaders have positive and clear objectives about health and safety in a construction project then this will have great influence on other team members. With clear goals and commitment of the team leader then only the followers too will be committed and strive to achieve the common goals. In the case of construction projects, leadership is more challenging due to the fragmented nature of the industry. In the production process, different kinds of people representing different disciplines are drawn together for a substantial length of time to complete a job. The industry also suffers from the 'blame-syndrome' when something goes wrong,

The tendency is for one party of the industry to blame another. In the case of health and safety, any incidents occurred will normally be blamed on the contractor or builders. This is because it is easy to put the blame at the site of occurrence, there and then and those closest and directly involved will be the scapegoat. From the words of Rt. Hon. Nick Raynsford, the Minister of State responsible for health and safety in a column for Construction News (HSE, 2002) 'Above all what is needed is a collective sense of responsibility within the industry for

its health and safety record, a recognition that the current level of accidents and fatalities casts a stain on the reputation of the whole industry regardless of where the failings lie, and a driving desire to own the solutions which will remove the stain.'

In the UK the focus is on the industry leaders, public and private, to give health and safety a high priority in construction. The actions of the top management regarding health and safety will have direct impact on the whole organisation. If the top management shows and actively involved in the matters concerning health and safety, then this will be recognised by their subordinates and will encourage positive safety culture. Mere statements without actions will lack credibility in the eyes of the workforce. Such leadership can also produce other business benefits including (HSE, 2002):

- A more committed workforce-'happy, healthy and here.'
- A focus on providing a quality product, on time and on budget
- Reduce litigation due to claims following injury or damage
- Lower insurance premiums.

The role of clients in the construction industry in promoting health and safety culture is crucial because if they demand high health and safety standards on their projects, all other team members will be obliged to follow. Such clients see best value (rather than lowest cost) and health and safety as integral parts of their projects. These clients understand the real meaning of successful projects, i.e. projects that are completed on time, within budget, acceptable quality and done safely. They understand that their reputation is at stake if not completed within those variables.

According to the HSE, (HSE 2002), clients have a pivotal role in setting and achieving high standards in health and safety because they:

- set the tone for the projects;
- have overall control of how contracts are set up and how the work is done;
- make crucial decisions, e.g. budget and time for projects; and
- Select the designers, contractors, etc who carry out the work and decide the timing of their appointments-determining whether they can work effectively as a team.

Clients should create an environment throughout all stages of the project, which delivers excellence in health and safety performance. They are good business and ethical reasons to do this. Even though some clients may wrongly seek to distance themselves from health and safety during the construction process they cannot take the same attitude to the safety of the finished product, which will be used by the users or members of the public. Increasingly the clients will be judged by their customers and financial analyst on their ethical stance in relation to health and safety in the same way as already happened for environmental performance and sustainability. Such issues have important impact on corporate image, and how local communities and stakeholders view them, in direct business terms, accidents on site may involve client liability and will lead to delays. Unhappy workers produce defective work.

Poor health and safety performance of the building when in use will result in ineffective delivery of business objectives. Clients pay the price for all this avoidable waste. The

Accelerating Change makes some recommendations for clients in order to deliver excellence health and safety performance as follows:

- Setting the requirements for healthy, safe working;
- Making health and safety of their customers, staff, and everyone they work with, or for, a business priority at the forefront of their agenda when commissioning construction;
- Using integrated supply teams to ensure the effective contribution of the entire supply chain to delivering a safe site and a safe product; and regular measurement of the extent of integration throughout the supply chain;
- Using the discipline of 'gateway' process to ensure they meet all their obligations to achieve a safe, efficient project. One that is more likely to be delivered on time and on budget. Gateways are critical predetermined points throughout the life of the project. Before gateway can be passed a review of all the project information and decisions to that date should be undertaken, preferably by a team of experienced people, independent of the project team. The project should not proceed to the next stage until satisfactory completion of the gateway review.

Jeffery and Douglas, (1994) further stressed the importance of optimal interaction between the designers and engineers with the clients. Clients play a critical role in the construction safety and site safety complimentary to the requirement of the client, completion on time, to cost and specification. Successful projects tend to be safe projects. The client must know exactly what he requires, he need to develop a detailed comprehensive brief for the design team. This is probably the most crucial stage for the successful and safe completion of the project. The

brief is a critical stage in ensuring site safety. Deviations from it at a later date can be a catalyst that triggers a series of events from designer through to operatives that culminate in a site accident.

8.3 Team Integration and Responsibility

The HSE of UK recognises the importance of team integration, to maximise co-operation and co-ordination between all parties, which, is crucial to improving health and safety in the industry. All parties have to have the same health and safety objectives and are willing to work together in order to attain the desired result i.e. improved health and safety in a project. Further emphasising on the importance of team integration, the Accelerating Change states that through integration of supply team, pre-planning can allow 'designing in' for health and safety and designing out certain risks (e.g. falls from height). Designers, whether they are architects or engineers that design temporary works or scaffolding need to become more aware of the opportunities they have to minimise risks on a whole life cycle, as well as their responsibilities under CDM Regulations.

As with Egan Report on Rethinking Construction, one of the five key drivers of change is an integrated project processes and teams. It is now realised that the fragmented project processes and teams will not help in improving the quality and efficiency of the industry. As mentioned in this report that "The rationale behind the development of an integrated process is that the efficiency of project delivery is presently constrained by the largely separated processes through which they are generally planned, designed and constructed. These processes reflect the fragmented structure of the industry and sustain a contractual and

confrontational culture. The integrated project processes and teams will need a sharing to synergy approach for the sake of improving performance of the industry. Finally, this approach is expected to affect the safety issues described above.

The need of sharing responsibility for controlling safety is to respond to the fragmented project processes and teams occurring in the industry. The key driver is that a descent and safe construction process should be of any concern of all project participants involved. Following this, a zero incidence is set as a strategic target for the construction project implementation. These can be achieved when all project participants are keen to improve their commitment for improved operative safety. Dester and Blockley (1995) asserted that "it is reasonable to suggest that management practices, including lack of leadership, lack of commitment, and lack of action are management manifestations of employee unsafe behaviour". Improving committed management for construction safety should be extended from construction process only to project design and project conception or inception. Therefore, designers, clients and the client's project team must also incorporate safety matters into their duties and responsibilities. The concept of design-construction integration (e.g. Tatum, 1987a, 1987b, 1990) needs to be expanded by incorporating project inception into the design-construction integration approach. This concept suggests that any matter of construction project, including safety should be addressed in the beginning of project inception, design and throughout project development process where there should be knowledge sharing between the project participants. They should commit to control foreseeable factors that undermine safety of construction process. The clients and their project team must be fully aware of their actions which may affect designers, constructors and operatives during the project design and

construction process. Any action taken by clients or the client's project team during the project implementation process must be reviewed to whether it will introduce any precursors undermining further processes.

The clients have to make sure the contractors recognise their contractual responsibility to work in a healthy and safe manner. Due to the optimal interaction with designers or consultants, clients have great influence to encourage designers to recognise the importance of health and safety aspects of any particular project (Jeffery and Douglas 1994). The client should realise that successful projects are those projects not only completed in time within cost and according to specification but also being done with due consideration for health and safety of the workers. The client is responsible to provide a detailed comprehensive brief for the design team.

Through their design and details, designers dictate construction methods and processes. Designers specify materials, which may be heavy, large in area, rough and sharp at the edges or even toxic and consequently presents potential harm to humans. Designers also influence procurement by advising regarding project period and contract documentations.

The need for designers to increase their contributions to health and safety is substantiated by both literature and descriptive surveys which determined, inter alia, that designers influence health and safety, contractors use designers output at bidding stage to provide costing for health and safety, mechanisms are required to ensure equitable allocation of resources to

health and safety at bidding stage, and shortened project periods negatively affect health and safety.

The design of a project will greatly influence the method of construction, which will in turn determine the degree of safety and health intervention. Designers should have the knowledge or perception of the impact of their design on the way it is going to be built and the danger involved in the process. Designers have the opportunity at the design brief stage to interact with the client and together make sure that the design brief is clear and leave minimum scope for any variations in the later stage. This is important because any variation orders (VOs) can be the catalyst that triggers a series of events from designer through to workers that culminate in an accident on site (Jeffrey and Douglas, 1994). Therefore, designers have a significant role for implementing total safety control. They hold a strategic position to design out risks of construction accidents. The following description elaborates designers' responsibility for designing a safe construction process as described by Duff & Suraji (2000). The role is not only associated with providing better design outputs but also minimising negative effects of the design process and maximising the value of their design skills and project knowledge. Designers also need to incorporate safety matters into their design process in order to control construction risks associated with design products. It was found that designers have contributed technically to construction accidents in various ways (Maitra, 1999). For example:

- Temporary loading case, which occurred during erection, had not been considered by the designers;

- Possible temporary instability during installing a structure was not stated clearly in a method statement;
- Possible impact of designs on construction risks were not clearly added by highlighted notes in design drawings;
- Possible requirement to shore structures during deeper trench excavations was not included in the technical specification, leading to a trench collapse.

Smallwood (1996) stated that The International Labour Office (ILO) in 1992 places the role in perspective the role of designers by recommending those involved with the design and planning should not include anything in their design and planning which would necessitate the use of dangerous structural or other procedures and, or hazardous materials which could be avoided by design modifications or by substitute materials. Designers should consider the health and safety of workers during maintenance subsequent to project completion, by designing so that such maintenance can be performed with minimum risk.

There are several generic approaches available to designers that will impact on factors in the planning, control and operation of the construction process. First, the design of the building itself can facilitate normal, foreseeable construction processes. The designers can consider in the designs such factors as:

- Extra loads of the structures during construction;
- Facilities for handling built into elements of the structures;
- Facilities for location and fixing of temporary works, such as access;

- Comfortable access to inaccessible parts of the building during construction (and maintenance);
- Influences of the building environment, such as ground conditions and building topography, on the construction process.

The International Labour Office (ILO) (1992) recommends that those involved in the design and planning of projects:

- Should not include anything in design and planning which would necessitate the use of dangerous structural or other procedures and, or hazardous materials which could be avoided by design modifications or by substitute materials, and
- Should consider the health and safety of workers during maintenance subsequent to project completion by; inter alia, designing so that such maintenance can be performed with the minimum risk.

Several authors have written about the importance of design in relation to health and safety. Jeffrey and Douglas (1994), "It has to be accepted that in terms of causation there is a link between design decisions and safe construction and maintenance. Especially maintenance access, late design, inadequate design and design changes during construction."

Second, information, collected for the purpose of design or during the design activity, and having potential impact on the safety (and efficiency) of the construction process, can be made available to the contractor through the design documentation. Risk assessments are now required but, in many cases, without detailed knowledge of the construction process

planned, designers would not be aware of the potential value of all the information held. Ways should be sought to structure, document and transfer this knowledge in a conveniently accessible form.

Third, designers can make their accumulated knowledge and understanding of the project available to the contractor through attendance at planning meetings. This will help to avoid contractors over sighting accident risks or simply being unaware of risk factors, through less familiarity with the features of the project.

For these ideas to be feasible there are a number of changes that need to take place. First, the mindset of many designers needs to change. Designers have to become aware that the output and organisation of the design process does not only affect the construction process in technical ways. Complicated design or high specification of materials may cause gaps with available construction technology, difficulty in obtaining materials required, unavailability of equipment or plant, or lack of experience of builders. These deficiencies can contribute to construction accidents. For example, Suraji, Duff and Peckitt, 2001 found that significant construction accident causes are found to include inexperienced workforce (4.2%), unsuitable construction materials (1.7%). Jeffrey & Douglas (1994) asserted that it has to be accepted that in terms of causation there is a link between design decisions and safe construction and maintenance. Especially maintenance access, late design, inadequate design and design changes during construction

Second, the mindset of many contractors needs to change. The planning, control and operation of the construction process is, of course, the responsibility of the contractor; but the designer has considerably more knowledge of the project than is normally made available to the contractor, in the exercise of this responsibility. This knowledge should be sought and welcomed.

Third, the designer needs help in defining knowledge that could assist the contractor. Designers cannot be expected to anticipate the health and safety significance of all the information and understanding that they possess. A good beginning to achieving this would be more comprehensive data on accident causation, and particularly the underlying or distal causes that include the effects of design and the design process, so that designers could begin to understand the wide range of influences that they have over the management of the construction site.

Fourth, contractual and economic issues will have to be addressed. Acceptance of more responsibility and involvement of designers comes at a price. Although the huge social and economic costs of construction accidents, and not just injury related ones, seems to provide clear incentive to improve the management of construction, increased involvement of designers will be costly. The potential costs and benefits require detailed investigation.

Contractors are the main contributors in establishing appropriate, i.e. safe, planning, control and operational management factors. However, they operate under a number of constraints, including the actions of designers as well as the action of clients or the client's project team

(Suraji and Duff, 2000), and may fail to provide safe working conditions, at least in part, as a result of these constraints. Current analysis of 1000 accident cases in the UK (Suraji, Duff & Peckitt, 2001) found that inappropriate construction planning (28.8%); inappropriate construction control (16.6%), and inappropriate construction operation (88%) are among frequent contributory factors in construction accidents.

Different from clients, the client's project team and designer, constructors as well as operatives have more direct exposure to safety matters in real condition. However, since the practice of TSM (Total Safety Management) is that all parties are responsible for safety, constructors and operatives may see the project construction process with less risk of incidents. In order to implement TSM, constructors need to develop a best practice model for detailing safety practice and then to integrate it with construction site management, risk assessment, planning, control and supervisory procedures. Constructors have to incorporate factors associated with construction planning, construction operation, and construction control into their strategic safety practices. Those factors have been derived by Suraji & Duff (2000) through extensive literature research.

The function of quantity surveyors as cited by Willis and Ashworth (1987) is primarily to undertake economic evaluations of projects, contribute to legal interpretations and applications, influence the technology relating to material and methods, and provide managerial and financial functions in terms of construction procurement and administration. The quantity surveyors also advise clients regarding the type of procurement system, project duration and selection of contractors. The preparation of contract documentation and bills of

quantities is also part of their expertise. The type of procurement system selected is important because procurement is a strategy to achieve client's objectives. It has a direct impact or relation to health and safety, which is one of the important components of a successful project.

Quantity surveyor's role in advising the client in choosing the right procurement strategy is crucial and according to Rwelamila and Smallwood (1999) incorrect choice of procurement systems has contributed to neglecting health and safety by project shareholders. In the "open-tender" system where normally it is very competitive, contractors frequently find themselves in the iniquitous position that should they make the requisite allowances for health and safety, and the risk of losing a tender will be higher (Smallwood 1996a). Even Loosemore et.al (1999) asserted that procurement is an important factor to provide balance of power between designers and contractors who are collectively responsible for health and safety performance.

The early integration between designers and contractors at design stage provides an opportunity for all parties to consider the issue of health and safety in the design. Meere (1990) advocates that integration of design and construction has a positive impact on overall health and safety. Dreger (1996) recommended that design-build contract form, as within the context of sustainability, health and safety included, it establishes one entity to provide both design and construction which has the greatest potential for success as it creates common project goals.

Verster (2004) asserted that "the cost engineering, quantity surveying and project management professions should also recognise developments in respect of new areas of knowledge, influence and the skills that would be required in the near future. He then quoted that knowledge areas that cost engineers or quantity surveyors should concern as "Zack (2004) clearly showed the effective role that the cost engineer (quantity surveyor) could play in respect of the new areas of safety, environment, finance and claims. In term of health and safety, all over the world, health and safety have become very important issues requiring effective management to ensure more acceptable working conditions for people. The cost engineer and quantity surveyor should play a role in respect of budgeting for health and safety as well as controlling cost in respect of risks, insurances, premiums and alternative selection".

8.4 The Need of Safety Framework

Smallwood, (1996) cited the need of looking into the process approach in dealing with health and safety. Through the process approach all parties involved in the production process, the clients, designers, principal contractors, subcontractors and manufacturers will be able to be scrutinised to assess their involvement and role to enhance health and safety. Small wood (1996) concurred that it is important to implement total Quality Management (TQM) which optimises the synergy between health and safety, productivity and quality which results in continuous improvement. Another process is partnering which established mutual project goals among all stakeholders, and will complements TQM and prevents adversarial relationships.

Levitte and Samelson (1993) described that Total Quality Management (TQM) has as its main thrust continuous improvement in customer satisfaction, employee satisfaction, productivity and safety. The TQM mission in construction is to build quality product- i.e. an error- free one – for the use by preventing errors in the construction process by integrating quality, productivity and safety. A major emphasis is on doing work right the first time, thereby cutting the amount of rework required to create construction that meets the user's requirements.

Oluwoye and McLennan (1994) highlighted that pre-planning safety can be defined as the determination of the most appropriate construction method and construction programme that will protect workers from any dangers or risks. The planning of safety is performed in conjunction with the planning of building work both design and construction. The design of the project is a great influence on determining the method of construction, safety plays an important role.

- The safety framework can follow the procurement process. Each stage of the process should consider health and safety issues. At all stages, the actions or inactions of all parties are recorded to show their impacts not only the implementation of health and safety but on the role of client leadership, team integration and other relevant issues. The following are the stages:
- Concept and feasibility: This stage begins when the client first thinks about having a structure built, repaired, refurbished, demolished or maintained. It overlaps with the start of detailed design work. During this period important decisions are made on

layout and outline, overall scheme and initial design and construction methods, and also the choice of procurement method to be used.

- Design and planning: During this stage detailed design works takes place. Final decisions on matters related to design and specifications are made. Final production information (e.g. drawings) and specifications are produced. The preparation of information for the tendering process also begins. For some form of procurement, there will be considerable overlap with actual construction starting (e.g. design – build).
- Tender/selection stage: This stage primarily involves the selection of the principle contractor for the construction process. The final production of tender document (e.g. bills of quantity) and the procedures and processes for the selection of the principle contractor take place.
- Construction phase: This stage covers the time for the principle contractor to plan, programme and prepare the construction work. Arrangements are made to start the work and then carry out and manage it.
- Commission and handover: this stage includes the activities required to bring plant, equipment, building management and similar systems into operation and finally the structure is handed over to the client.

The process protocol map that was developed by the research team at the University of Salford has provided a framework of delivering health and safety matters across the procurement process (A generic guide into the design and construction, 1998). Although this process protocol does not only concern with safety and health, but health and safety statutory

have been included in the map. In this case, health and safety issues are already addressed in the pre-project phases, then pre-construction phases and finally construction phases.

In the phase three of pre-project stage, information on statutory criteria and regulatory issues related to health and safety and preparation CDM regulation are included in the substantive feasibility study and outline financial authority. In the phase four, five and six of the pre-construction stage consisting of outline conceptual design, full conceptual design and coordinated design, procurement and full financial authority, health and safety issues are concerned with revising CDM assessment. In the phases seven and eight of the construction stage containing production information and construction respectively, the process protocol related safety is to finalise health and safety plan and then manage health and safety.

For further application, the generic safety protocol related to the process protocol is addressed from the substantive feasibility study and outline financial authority to the construction phase of managing health and safety in construction site. In the phase of feasibility study and outline financial authority, the initial safety and health assessment are based on the solutions identified at the feasibility study phase. In the phase of outline conceptual design, the revised safety and health assessment was based on site and environmental revisions. In the phase of full conceptual design, the updated safety and health assessment produce pre-tender health and safety plan. In the phase six of coordinated design, procurement and full financial authority, the updated health and safety assessment produce health and safety plan based on detailed design solution. In the phase of production information, the finalised health and safety assessment produce all health and safety issues before construction works that should

be documented and finalised. Finally, in the phase of construction, the health and safety plan is implemented and monitored. The following figure describes the safety protocol framework.

Project Stage	Pre-Project Stage	Pre-Construction Stage			Construction Stage	
Outputs	Phase 3: Substantive Feasibility & Outline Financial Authority	Phase 4: Outline Conceptual Design	Phase 5: Full Conceptual Design	Phase 6: Coordinated Design, Procurement & Full Financial Authority	Phase 7: Production Information	Phase 8: Construction
H & S Under CDM Framework	Initial CDM assessment	Revised CDM assessment	Updated CDM assessment	Updated CDM assessment	Finalised CDM assessment	Manage health and safety
Verification on H & S	Based on the solution identified at this phase	Based on site and environmental revisions	Pre-tender health and safety plan.	Health and safety plan based on detailed design solution	All health and safety issues before construction works should be documented and finalised	All actual health and safety should be presented and compared with the plan to enable the feedback loop for future projects.

Figure 8.1 Safety Protocol Frameworks Model –Salford University

8.5 Improving Procurement Process for Safety

In this research, procurement process is studied to identify its potential role as a driver to enhancing health and safety culture and practices. This research found the gap of procurement practices between the UK and Malaysia with regard to health and safety implementation. The following discussions summarise strategic issues related to health and safety practices found in the case study. The first is about safety policy introduced by clients. Under the CDM regulation, the UK clients have to provide a clear safety policy in order to bring safety matters into pre-construction stage including design and tendering in which a planning supervisor will take charge in imposing to impose health and safety. In Malaysia, health and safety matters are only brought in the construction stage. During the design stage, the designers only focus on structural safety rather than designing out any risks that can lead to construction accidents. Although the design and built is chosen as the procurement method, there is no input relating safety and health from contractors in the design stage. In the UK practice, safety and health plan prepared by contractors is always required in the tendering process and before construction works starts and will normally be verified by the planning supervisor. In the case of the UK, financing health and safety implementation is automatically regarded as everybody must comply with the CDM. However, in the case of Malaysia it may be possible to introduce that all parties agree to a lump-sum or provisional sum allocated in the tender document so that contractors will have a fare and standard amount for safety and health implementation.

Therefore, improving procurement process with regard to the enhancement of health and safety is of important attempt in the Malaysian construction industry. In order to provide

better understanding of the procurement process improvement, the following discussion introduces how to put health and safety issues into practice. In the beginning of project briefing, consideration should be given to health and safety issues affecting all groups namely: contractors and others affected but not directly involved and those who operate and maintain and also ensure that any communication in any way regarding health and safety by any parties is in place as well. It is also important to look into the involvement of client, to ensure that the project will be according to best value principles and due regard to health and safety and then client may consider to develop policies regarding health and safety. This can be reflected by the development of project costing associated with the consideration about health and safety and the decision of project duration needs to take into account of health & safety.

In the process of appointing of design consultants, clients should stress the site safety considerations in the design. In this case, design manager has to look into the details and include health and safety aspects in their design. The client may provide opportunity the designers to invite the main contractor as part of consultative services to assess build ability option particularly with regard to safety and health. Furthermore, evaluation for contractor's qualification during selection process covers a tenderer's approach to health and safety implementation strategy. For selecting tenderers, key selection criteria should include relevant issues concerning their previous performance on health and safety and their current approach to health and safety.

It is very strategic for the client to develop procurement strategy while taking into account team integration and health and safety. The client can also influence in determining the method of procurement. No matter what preferred procurement solution is, client still need to develop performance specifications that make clear their commitment to health and safety throughout the life cycle of their procured facilities. They need to ensure that such obligations are fully addressed through supplier's selection and appointment and subsequently during contract oversight and management.

In contract preparation, introduction of specification regarding health and safety and review of the determination of budget and schedule while taking into account of health & safety plan are also of important improvement for the procurement. Invitation of expression of interest may put an emphasis on health and safety and include safety as part of quality. In tender process, identification of tender document particularly specification relating to health and safety is imposed. In this case, a forum for all parties involved having discussions and workshops on safety and health measure is provided. During construction, all parties can undertake regular site meetings including discussing any safety and health issues and provision of health and safety deports.

8.6 Enhancing Health & Safety Practices

The gateway procurement discussed above is very well concerned with improvement of health and safety practices across any stage of procurement process. The Construction (Design & Management) regulation then further emphasises what actions should be taken by clients, planning supervisors, principal contractors and contractors for the safety and health.

Chapter 8: Discussions And Implications

The following discussion is to show the role of the parties in improving health and safety practices directed under the CDM regulation. In this regulation, the client is the most responsible parties to put health and safety concern in the first place since the beginning of the project development process, feasibility, design, pre-construction, construction, and then post-construction followed by the other parties' actions.

Feasibility/ Design Stage

In this stage, the client appoints an agent who must be competent to manage a project successfully. In order to make all relevant health and safety is in place, the client then appoints a planning supervisor who is responsible to the implementation of health and safety across project delivery process. In this stage, the scope of the planning supervisor's duties needs to be determined since on occasions the client may wish for a more comprehensive approach to be adopted. The planning supervisor's role in this stage is to establish the extent of service to be provided, ensure initial notification to Health & Safety Executive and copy to client then the client to forward relevant information on state and or condition of premises. It is then followed by establishing designers who are competent and then provide proper allocation of adequate resources. The planning supervisor then confirms that the designers are competent and they make allocation of adequate resorting to the client. The role of the planning supervisor in this stage will help to bring health and safety matter since the beginning of the project.

Design Stage

In this stage, the client may appoint an agent provided that agent is competent to perform the duties of the client. It is perceived that competence and adequate resourcing are essential prerequisites for successful health and safety management. In this case, the client and planning supervisor are aware of the extent of service to be provided. The planning supervisor must send an initial notification to the Health and Safety Executive and gives a copy to the client. The design stage is the critical control check and could be undertaken by the planning supervisor prior to construction. In this case, the planning supervisor must check and look in detail any design which may lead to risk of construction accident. This is required as part of the design coordination and will feed into the design process and the pre-tender health and safety plan and possibly the health and safety life. The planning supervisor must be available to give adequate advice to both the client and contractor on both competence and resourcing. The planning supervisor must also ensure that the designers to consider in any action they can do to avoid, prevent and protect any risk leading to construction accident. The planning supervisor must ensure design has included adequate information about project, structure and materials and also ensure a good cooperation between designers so that adequate regard is given to aspects of health and safety management and finally receive risk assessment proformas from designers. The planning supervisor must ensure that a risk assessment strategy is being followed by the design team and that a design contribution is being made to health and safety management based on the hierarchical response of elimination, reduction and transfer. The planning supervisor can also make a notification of residual hazards to be communicated separately for inclusion in the pre-tender health and safety plan and or health and safety file. The coordination of health and safety issues relevant to design must be

undertaken by the planning supervisor, who must ensure that information flows between the designers and the relevant health and safety issues are fully considered by everyone involved in the design process.

In this stage, the role of designers is very important to health and safety. The designers must ensure design has given adequate regard to avoidance of foreseeable risks, combating risks at source and prioritisation of measures to protect all individuals. The designer must make relevant information about project, structure, and materials and then cooperate with other designers and planning supervisor in the exchange of information relevant to health and safety management and finally forward risk assessment proformas to planning supervisor.

Pre-construction Stage

Tendering is a part of important pre-construction stage in order to procure a suitable principal contractor to do the project according to the design and requirement established. The client must appoint a principal contractor to manage the construction phase of the project, subject to competence and resourcing being established. The client must be satisfied that the principal contractor appointed has the competence to perform the function. This is often established through pre-qualification procedures. In this stage, the client must ensure suitability of construction phase health and safety plan. The client must be satisfied that the principal contractor has planned the contract satisfactorily in terms of health and safety management. The role of designer in this stage is to forward risk assessment proformas to planning supervisor. These forms enable the planning supervisor to confirm that a risk assessment

strategy is in place and allows residual risks to be transferred by the planning supervisor into pre-tender health and safety plan and possibly into the health and safety file. Thus the construction phase health and safety plan must be suitable before commencement of construction. In this stage, the planning supervisor must ensure preparation of pre-tender health and safety plan is in existence since it is a key document and notifies the tendering contractors of the significant health and safety issues specific to the individual project. In this stage, the planning supervisor must ensure preparation of pre-tender health and safety plan. The planning supervisor must keep himself available to give advice on the contractor's competence if required by the client. In the post tender, the planning supervisor must keep himself available to give advice on the adequacy of resourcing if requested by the client. The planning supervisor must confirm suitability of construction phase health and safety plan submitted by principal contractor to the client. It is imperative that commencement of construction does not start until a construction phase safety and health plan is proved to be suitable. Once it is confirmed, the planning supervisor will notify to the client and principal contractor.

During pre-construction stage, principal contractor holds a very important role in ensuring all health and safety issues are addressed in the pre-tender, post tender and pre letting. In this stage, the principal contractor will receive pre-tender health and safety plan from planning supervisor. This will inform the principal contractor the significance of health and safety issues specific to the project. In tender, the principal contractor must ensure tender submission accounts for adequacy of relevant health and safety management resources. All health and safety issues, particularly those outlined in the pre-tender health and safety plan should be

adequately resources by the contractor and reflected in his tender price submission. In post tender, the contractor should prepare a construction phase health and safety plan and forward to client and or planning supervisor for further checking and sanctioning. The plan must also include rules for the health and safety management of the construction work. Every single issue related to construction health and safety plan should be settled before commencement of the work on site and the contractor receives sanction to start construction. This is the client's acknowledgement that the construction phase health and safety plan is suitable.

Construction Stage

During construction stage, the client should be kept well informed of health and safety record by planning supervisor. In this stage, the health and safety file should be provided for the client. This is the health and safety manual for the project and should be handed over to the client by the planning supervisor. It remains the property of the client thereafter. The client should confirm the receipt of health and safety file and it should be relayed to the planning supervisor. This will effectively show the planning supervisor's involvement in the project. The planning supervisor will ensure health and safety management is addressed as an integral part of all project execution on site. Health and safety issues must be addressed at all progress meetings to monitor competence and enhance safety culture on the ground. This meeting agenda can be addressed by the contract administrator in the absence of the planning supervisor and copies should be forwarded accordingly. Approaching the ending of construction, the planning supervisor will ensure preparation of health and safety file. This is the health and safety maintenance/ operation manual for completed project and it is usually compiled and finalised by the planning supervisor with relevant information from any parties

involved in the project execution. In the case of designer's role in this stage, the designer should ensure 'as built' record drawings are drafted and forwarded to the planning supervisor plus other relevant information such as method statement and residual risks. These are for inclusion in the health and safety file and are factual representations for future reference in terms of maintenance and operation. Such drawings include schematic layouts of drainage, electrical and mechanical works. In the post construction, the designer must ensure all risk assessment proformas and other relevant documentary information is maintained for the full period of design liability.

The role of principal contractor during construction stage is huge and very significant. The principal contractor must ensure every contractor complies with rules and cooperation between contractors occurs. The principal contractor must coordinate the health and safety management of all other contractors on site. This can be achieved through appropriate induction procedures and/or meetings. The principal contractor must ensure that all contractors and employees comply with site rules as contained in the construction phase health and safety plan. In this case, the principal contractor must ensure only authorised persons are allowed on premises. Unauthorised personnel are kept away from the premises where construction work is being undertaken. Due attention must therefore be given to suitable fencing, lockable gates and signs.

During the construction stage, the principal contractor must ensure every contractor provides employees with information on associated contract risks together with appropriate health and safety training. This to ensure that everyone coming into contact with the construction process

has received the relevant information on the hazards associated with the project. Induction training, tool box talks and related meetings are all suitable means of achieving this objective. Contractors should also contribute to the development of the construction health and safety plan by furnishing method statements appropriate to their procedures. The principal contractor must also ensure employees and self-employed can discuss and offer advice. This extends the communication link between employees, self-employed and the principal contractor. This can be carried out with appropriate agenda during progress meeting or interim meetings where applicable. In any case, the principal contractor must ensure arrangements exist for coordination of views of employees or their representatives in matter of health and safety. In the end of construction phase, the principal contractor should pass over relevant information to the planning supervisor for health and safety file.

In the case of contractors working on site, they must cooperate with the principal contractor on matters of health and safety management. They must promptly provide principal contractor with information relevant to health and safety and comply with directions from the principal contractor. All death, injury, conditions or dangerous occurrences should be notified to the principal contractor and reported to the planning supervisor. The contractors are also required to promptly provide information to principal contractor for inclusion in the health and safety file as requested by the planning supervisor or any matter that should be available for the health and safety file. The contractors must also provide employees and self-employed with information regarding the name of planning supervisor, principal contractor and relevant content of construction phase health and safety plan including safety management aspects of the project.

As with the practical implementation of health and safety under the CDM regulation above, the construction health and safety practices are driven since the beginning of the project with active roles of the client, designers, planning supervisors and the principal contractor as well as contractors on the ground. This looks that safety and health issues are addressed in detail in every single stage of the project. In this case, the discussion about health and safety on site is taken into account in the upstream part of the project organisation and throughout project delivery process to the ground. This shows that procurement process is not just concerned with cost, time and quality of the project but importantly safety.

8.7 Implication for Research

This section deals with lessons learned from the case studies and discussions as well as recommendation for improving health and safety. In this case, some lessons are related to the client's role and involvement of project participants required in addressing health and safety in the overall stages of the procurement process. Client leadership and committed project participants were encountered as prerequisite for enhancing safety and health culture and practice. This will help to build team integration and share responsibility across stages of the procurement process. In the project conception stage, a clear project brief and client's policy regarding health and safety may assist the client's representatives, such as planning supervisor and designers to address safety and health issues during the design stage. As the client puts more attention on safety and health, and the designers deal with designing out risk undermining health and safety in the construction stage while contractors give more inputs during the design stage, safety culture and practice will improve significantly.

For further consideration of improving health and safety, this chapter also describes the need of a safety framework embedded in the procurement process. Safety framework is a tool to ensure safety and health is addressed in the procurement process. The purpose of this is to provide a framework for carrying out any safety practice across every stage of the project procurement process. This safety framework was adapted from the process protocol developed by the University of Salford, gateway model and also the CDM regulation. This may assist everybody involved in the procurement process to identify safety issues should be addressed in every stage of the project procurement process.

The Malaysian construction industry has been playing an important role in developing the countries. However, the industry image currently needs to improve. The challenges are, among others, shortage of labour, deteriorating quality of works, increase in the number of accidents on construction sites, material shortages and the fragmentation and segmentation of the construction industry. In the Malaysian construction industry, many attempts have been made to enhance safety culture and practice. Those attempts are particularly concerned with legislation approaches focusing on the downstream of the project procurement stage, such as implementation of green card for construction workers. Safety in construction is still regarded as a matter of provision of personal protective equipment, such as helmets, glove, boots, harness, and safety nets. Safety is only viewed as part of construction process on site rather than a whole process of project development. Therefore, under these circumstances, only contractors should provide more concerns of safety. In the Malaysia case, currently no attempts have been introduced to promote safety and health since in the beginning of the

procurement stages as the introduction of CDM regulation in the UK construction industry. The issue of safety should be addressed by all parties from the beginning of the construction process. Procurement therefore can be a potential tool to improve site safety. This research looks into the potential of construction procurement process in Malaysia to enhance health and safety.

Many studies have suggested that construction safety should not only concern with operational and technical aspects of production line or project participants at downstream of project implementation but more systemic process incorporating the whole process of the project procurement since project conceptualisation to construction operation or even maintenance works. Traditionally, project procurement only concerns with cost, quality and time, therefore, enhancing safety culture and practices should deal with improving concerns and involvement within each stage of the procurement process where any project participants, including clients, the client's representatives, designers, architects, contractors, and operatives are required to participate for their best to eliminate, reduce and avoid any undermining factors to safety while putting proactive safety measures.

This research embarked since the underlying question of how actually procurement policy can improve health and safety culture and also to what extent that health and safety issues can be addressed across the project procurement process. For this reason, three propositions were established. The first proposition is that the greater the involvement of client, both in the public and private sectors, in the earlier stages of the production process, the more impact they will give in enhancing health and safety. The second proposition is that procurement is a

stronger driver than legislation to enhance health and safety in the industry. The third proposition is that the greater the degree of team integration the better will be the health and safety performance.

The main purpose of the research was to study construction project procurement process, focusing on procurement policy, strategies, and activities for enhancing safety culture and practice in the Malaysian construction industry and its comparison with the UK counterpart. This research covers identification of constraints in utilising procurement as a tool to enhance safety and health; investigation of role of the government in fostering project participation to improve safety; investigation of safety culture and practice throughout procurement process; comparison of any attempts for improving safety and health in the UK and Malaysian construction industries; and finally the introduction of safety and health protocol for embedding safety and health culture and practice into the procurement process in the Malaysian construction industry.

A case study methodology was used in this research. It was selected to gain in depth understanding of the procurement process insights while investigating safety culture and practice implemented in a construction project on a real case basis. It was believed that this methodology provides a systematic inquiry or search into safety and health issues within the project procurement phenomenon of interest while verifying the propositions introduced. In this methodology, the researcher involved in the real life situation and observed the interest being studied through involvement of project meeting, structured interviews and further

discussions, and document searches. In this research, for triangulation purpose, a questionnaire was also sent to the industry stakeholders.

Literature review was also conducted to provide understanding of safety and health issues in construction and develop questions for the interviews and discussions with the project participants involved. The literature review focused on safety culture and practice, the project participants' role in improving health and safety, and the nature of procurement process, and attempts have made to promote health and safety in both UK and Malaysia.

In this research, 4 construction project cases were studied. Two construction projects are in the UK and remaining two cases are in Malaysia. In order to make comparison, both in the UK and Malaysia, one case project was executed under design-build procurement system, while another one was procured under traditional procurement system. This could give understanding of how different procurement system may affect the effectiveness of safety and health issues addressed by different parties involved. Findings of this research and conclusions are described in the following section.

8.8 Implication for Practice

Procurement process can be regarded as a potential media to enhance health and safety culture and practices. However, some issues have constrained the procurement process in the Malaysian construction industry, such as constraints at project planning stage caused by procedures in obtaining statutory approvals; constraints in availability of local construction materials, mainly cement and timber; constraints in availability of Malaysian labour (both

skilled and unskilled); constraints in the availability of professionals; constraints in availability of Malaysian specialist contractors; political and bureaucratic interference; lack of reliable source of information; lack of suitable sites (Rashid, 1998). The issue of skilled labour has given rise to not only the quality and productivity but also to the awareness of safety standards and compliance with safety procedures.

Those constraints and risks could be stimulated by internal procurement system in the form of contractual dispute, delay, cost overrun and quality defects or even external supra system environment, such politic, economic and unexpected disasters. The point is how to make procurement process benefits all parties involved. The procurement objective can be achieved efficiently, effectively and cost effectiveness.

The government, as the big public construction project client, has potential influence to enhance safety and health in the procurement process. In many countries, the public procurement scheme by government has been used as a policy instrument. Some policies are for instance stimulating economic activity and growth, protecting national industries or interest against foreign competition, improving the competitiveness of certain industrial sectors, remedying regional disparities; and achieving certain social policy functions, such as utilisation of local and increased employment of the disabled. Other public policies are also enforced through public procurement, such as anti discrimination participation, protecting indigenous people, creating opportunities for poverty alleviation. From these lessons learned, the procurement process can, therefore, also potentially drive every party involved to be committed in improving safety and health in construction.

Procurement systems and methods in Malaysia are adopted from the UK since the influence of British colonial. The traditional procurement method is mostly used by many clients in Malaysia. Few clients use design build and management contracting. The government has also used the public procurement process as a policy instrument, particularly to give a business privilege for indigenous "Bumiputra". However, no attempts have been made to utilise the procurement process including standard forms of contract as a policy instrument to specifically enhance health and safety culture and practice.

Clients can actually, throughout procurement process, put safety matters in place. They may influence all clients' project team, not only constructors and operatives on site, to eliminate, reduce, or avoid any precursors undermining safety in their duties. Designers, quantity surveyors, architects and engineers have to incorporate constructability with safety as important as cost and quality issues into their design criteria, drawings and specification as well contract documents they produce. In this case, any attempts to improve safety can be carried out by everyone on every stage of construction procurement process while promoting better safety culture and practice in the construction industry.

In the UK, safety and health culture and practices in both public and private sectors have been driven through regulation and enforcement. Introduction of CDM regulation has a big impact on overall project procurement. The CDM regulation has brought health and safety issues to the upstream of production line while imposing designers and clients for more responsible on health and safety. In the case of Malaysia, the DOSH and NIOSH have been established to

promote health and safety culture and practice, including training provision. In the case of construction safety and health, the CIDB has introduced a green card to enhance safety and health practices on site. However, they are still concerned with downstream level of health and safety aspects for operatives. The industry clients and players still have less concern to health and safety as compared to the UK construction industry. The regulations and initiatives concerning health and safety in construction still focus on downstream process of construction project delivery. Health and safety is still viewed as a matter of constructors' responsibility.

In fact, many evidence from studies elsewhere show that contributory factors of accidents on construction sites stem from upstream part of production lines. Those studies, therefore, suggest that health and safety should be addressed throughout project development process by all project participants involved.

The comparison of safety culture and practice in the procurement process in both countries found that the procurement process in the UK has dealt with health and safety issues since the beginning of project stage as required by law of CDM Regulation. In this case, the client appointed a planning supervisor to address any undermining safety on the production line as a result of design. The coordination between the planning and designers has taken place to consider any safety related design. The client also imposed the tenderers to submit pre tender stage health and safety plan to be included in the tender proposal. The contractor is also asked to provide method statement where safety and health also included. However, the project procurement process in Malaysia has not been regarded as the driver to enhance safety. Although safety and health matters have already been included in the standard forms

of contract, this matter is only concerned with safety issues on site. Therefore, health and safety is only looked as the downstream of project construction process rather than embedded in whole life cycle of project.

In general, project participants, from the client's agent, architects, principal designers, quantity surveyors and contractors in both countries mostly agreed that safety and health issues should be brought into all stages of the procurement process. It was found that project participants expect that the pre-tender health and safety plan provided by the client has sufficient information for contractors to prepare for the post contract health and safety plan. The contractor company's safety record has significant influence on the success of the implementation of health and safety as lessons learned for future development. There is a need of all sub-contractors and suppliers to be given adequate instructions or information regarding their company's health and safety policy to ensure they understand the company's stand regarding health and safety. This will achieve when the client's policy on the project procurement provide significant impact on the overall success in term of health and safety as the client takes a leadership in health and safety implementation.

As with the client has an important role and influence in ensuring all parties are serious in implementing health and safety in the project. Therefore, the client leadership is of important for promoting health and safety as well as the integration among the project participants. The client is also instrumental in leading the team to ensure everybody plays their role in the implementation of health and safety during the design stage and construction stage of the project. In this case, the early involvement of all parties in the early stage makes it easier to

ensure that health and safety of the project is considered by all those parties since in the design stage and then the construction stage. A completed drawings and specification as well as risks associated with construction works provided by the designers will assist contractors to prepare for the health and safety plan in detail, including adequate cost consideration for the health and safety. However, conventional method of procurement gives the contractor no opportunity to be involved in the early stages of design and share some experiences and inputs in relation to health and safety of the project. Compare to the traditional type of tendering, the two-stage tendering is more successful in team building and work well from the early stages and this greatly enhances the chance of success in terms of time, quality and cost.

In construction stage, the main contractor has strong influence on the commitment of their sub-contractors and therefore the main-contractor is required to give enough information and instructions to the sub-contractors regarding health and safety. It will also assist the main contractor when the client's agent can have more impact on the safety culture of the workers by direct contact e.g. dialog, discussion with the site operators regarding health and safety. In order to strengthen the safety culture and practice on site and the site operators follow all the health and safety regulations, the involvement of the client on site is important, and their regular site visits and direct communication with the operators will have great impact on their safety behaviours.

Findings of the questionnaire survey on the project participant's opinions show inspection or safety audit authority is of important activities to health and safety. It means that regulation or statutory approaches are still required to drive the implementation of health and safety in

construction. The findings uncover that lead by example, good communicator are the most influential indicators of the leadership qualities to enhance health and safety culture and practices. In Malaysia, safety officers, design engineers/ architects and contracting companies hold important role in dealing with safety and health in construction projects. In the UK, as with CDM regulation mentioned, principal planning supervisors and contracting companies also hold important role in enhancing health and safety practices.

Findings of the questionnaire survey to the industry stakeholders have verified that the project participants' opinions. In both countries, legal and insurance requirements are still the most influential factors affecting the implementation of health and safety in construction. It means that statutory requirement become an important instrument to enhance health and safety in practice. Partnership has been regarded as a good deal to the implementation of health and safety in construction. Other issues were also found such as, site managers should have a very good understanding of health and safety; client representatives should convince the client about the importance of H & S so that the client is ready to invest more in H&S; and planning Supervisors/ safety officers help improve health and safety are regarded as the most important attempts to promote health and safety. In the UK, most project participants have contributed to some scope to large scope of improvement, while in Malaysia only government, and safety inspectors/ officers have contributed to large scope. The first and third propositions of this research were verified in the case study in the UK only. However the second proposition has not been verified in both case studies in UK and Malaysia.

8.9 Research Contribution- Procurement Safety Framework

This research finally introduces a safety framework for the Malaysian construction industry. It has provided a framework of delivering health and safety matters across the procurement process. This framework is based on the model established by the Public Works Department of Malaysia (PWD) or Jabatan Kerja Raya (JKR, 1992) Malaysia which is described in chapter 2.This model is used by the government in providing guidance for implementing public projects. The framework is in stages as follows:

Stage 1: Development Plan and Approval

In this stage the need of a particular project is determined based of the Federal Government's Five Year Plan and involve all the ministries in the government. The safety aspect of the project is not relevant here because at this stage the amount allocated and time of implementation is decided by the relevant ministry in the federal government.

Stage 2: Funding

The government decides where the money comes from for the project. The estimate of the total cost normally comes from various relevant government department or ministry e.g. schools will be under the education ministry, hospitals from ministry of public health etc. Again the issue of site safety is not considered here.

Stage 3: Preparation of Project Brief

In this stage, the client will appoint consultants to implement the job. All consultants are registered with the Ministry of Finance and every year the consultants have to renew their

registration. The consultants namely the architect, engineers and surveyors have their professional body to ensure their integrity and professionalism.

This is an important stage to inculcate the safety awareness and culture to all the relevant ministries and consultants. The following steps can be taken to ensure all ministries under the federal government are aware of the safety standards to be implemented in all public projects.

a) The Ministry of Finance shall provide a guideline and instruction making it compulsory to all ministries to have a Written Safety Policy regarding safety requirements to be followed in all projects. The Safety Policy shall include guidelines of implementing safety in procurement process of a project.

b) Briefing to all consultants to ensure that they are aware of the safety policy and its importance before any appointment or engagement.

c) In the project brief all safety issue shall be discussed to ensure the design has taken safety in the use of building materials, construction method and maintenance is thoroughly considered.

d) The client's shall make it clear that the success of the project must include a target of zero accident besides the normal target of within cost, time and quality.

This is the most important stage whereby the client, the owner of the project to show that they are very serious about safety and as the leader of the team; this is a great opportunity to utilise the procurement in enhancing safety culture among the consultants and contractor.

Stage 4: Land Acquisition

This is where all necessary land acquisition process takes place through relevant local authorities or departments. In this stage the safety issue of the project is not relevant.

Stage 5: Site Survey and Soil Investigation

In this stage the land surveyor and civil engineer is involved. The civil engineer in his record shall include any soil or land condition that has the potential safety hazard in earthwork for the project. The hazardous site condition shall be reported to other consultants for their consideration in their part of the design.

Stage 6: Preparation of Preliminary Design and Site Layout

In this stage normally all the consultants have been selected. Prior to the appointment of consultants, the client must highlight the safety policy and the importance of taking safety seriously in the design of the project. The designers must be aware of the safety considerations in their preliminary design. Even the quantity surveyor must allocate a reasonable amount for safety requirements of the project. The PDA (Preliminary Detail Abstract) prepared by the quantity surveyor must include an allocation for safety.

Stage 7: Detail architectural and/or engineering designs

All architects and engineers should highlight any safety issues in their design and present these issues to the client for further discussion before any approval of the detail design. Any hazardous conditions participated in the construction process of the design must be specified to all parties especially to the contractors/builders so that they can take this issue into consideration when pricing the project.

Stage 8: Preparation of the preliminary estimate and exercising of cost control

The quantity surveyor has the obligation to allow reasonable amount for site safety include in the estimate. The client must check whether the estimate provided has included cost of site safety.

Stage 9: Preparation of tender documents

This is an important stage where the client has the opportunity to choose an appropriate type of contract which gives better opportunity for all parties to consider the safety aspects of the project from the initial stage. Tender document prepared by the quantity surveyor must be very clear and specific about the requirements of safety in the project. The contractor must be given a fair and clear indicator of the safety requirements in the contract documents to avoid future disputes. The designers should also look into the tender document prepared by the quantity surveyor to ensure that all safety issues been clearly documented.

Stage 10: Invitation and receipt of tenders

All tenderers/bidders must be registered with the client and have proper safety policy and good safety record. This is the opportunity for the client to inculcate safety culture among the builders. Only registered builders are invited to bid for jobs and they must take construction safety seriously. In receiving tenders, the quantity surveyor must ensure that only registered tenderers are accepted for the bidding process.

Stage 11: Evaluation and acceptance of tender

Besides technical and financial aspects, the safety record and safety awareness of the contractor must also be one of the criteria in the evaluation process. A pre-qualification stage should be implemented. This is to ensure only qualified bidders with safety awareness and good understanding of the safety requirements chosen for the next stage of the tendering process.

Stage 12: Preparation and signing of the Contract Documents

At this stage the final selected contractor should be ready to sign the contract and understand the safety requirements after the earlier processes of tendering.

Stage 13: Supervision and monitoring of progress of work

The client should ensure that all site staffs are well trained and understand the safety requirements in the contract. A special provision should be provided in the contract document to give the site supervisor or superintending officer the power to stop work that do not follow the required safety standard.

Stage 14: Extension of time for completion

No extension of time should be given to any stop-work for failure in performing the required safety standards during construction. This is a deterrent factor to ensure the contractor abides to all safety regulations.

Stage 15: Imposition of Liquidated and Ascertained Damages

No excuse for the contractor to be penalised for the time the work has to be stopped due to failure in safety requirements. Again, this is to ensure all work done with high regards for workers' safety.

Stage 16: Determination of contractor

A clause in the contract should also make safety factor a consideration to determine the contractor in a very serious safety case.

Stage17: Completion and handing over of work completed and making good of defects

In completion, detail safety record of the project should be analysed and the grading of the contractor regarding the safety standard should be given. This record is for future tendering purposes for the contractor and a post-mortem of the safety record should be analysed for further improvement for all parties.

Stage 18: Nomination of sub-contractors and suppliers

Make it compulsory for all nominated sub-contractors and suppliers to have a former safety contract with the main contractor and a copy of the contract given to the client for record purposes. In this way the sub-contractors and suppliers will understand their safety responsibilities and aware that they are also being monitored by the client.

Stage 19: Administration of payment

The quantity surveyor must ensure all payment regarding safety requirements is well documented and administrated. An incentive scheme should be introduced and contractors with good safety record should be rewarded.

Stage 20: Preparation of valuation work and the Final Account

The Final Account should include a detail costing related to safety and safety cost data is important for future references especially for estimating purposes.

8.10 Future Works

The research only covered two different procurement systems, which are traditional and design-build with four different project cases in both the UK and Malaysia. As with many different procurement systems exist, therefore it is needed to research the impact of different procurement systems on the effectiveness of the implementation of health and safety culture and practices in the Malaysian construction industry. A comparative study between a public project and a private project is also important to identify the differences in safety culture between the clients.

This research introduces the process protocol as the basis for the case study methodology to identify any safety and health issues regarded in every stage of the project procurement process. However, the case study was not started since in the beginning of the project stage until the project finished. Therefore, a further research may use the process protocol as the basis of a longitudinal survey on health and safety issues or other relevant subjects throughout the project stages.

A challenging research can also be pursued with regard to safety and health knowledge management particularly knowledge sharing to support design and construction integration in the design and build procurement system. This may help to identify the effectiveness of knowledge exchange between contractors who have more experience of construction works and designers who have experience of designing constructed facilities.

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APPENDIX A: QUESTIONNAIRE FORMS

A. Type of construction the respondents involved in

Type of Construction	None		Many	
	0	1	2	3
Private residential refurbishment	☐	☐	☐	☐
Housing re-development	☐	☐	☐	☐
New housing development	☐	☐	☐	☐
Office buildings	☐	☐	☐	☐
Other commercial buildings	☐	☐	☐	☐
Decommissioning / demolition	☐	☐	☐	☐
Building maintenance	☐	☐	☐	☐
Transport infrastructure	☐	☐	☐	☐
Chemical plants	☐	☐	☐	☐
Utilities (water, power)	☐	☐	☐	☐
Ports/harbour	☐	☐	☐	☐
Tunnelling	☐	☐	☐	☐
Others	☐	☐	☐	☐

B. Your views on the construction sector

1. The importance of the participants to the construction health and safety

Project Participants	High priority	Medium priority	Low priority	Not a priority	Not sure
Clients	☐	☐	☐	☐	☐
Design engineers/ architects	☐	☐	☐	☐	☐
Contracting company	☐	☐	☐	☐	☐
Specialist sub-contractors	☐	☐	☐	☐	☐
Principle planning supervisor	☐	☐	☐	☐	☐
Site-workers / operators	☐	☐	☐	☐	☐
Unions	☐	☐	☐	☐	☐
Trade associations	☐	☐	☐	☐	☐
Professional institutions	☐	☐	☐	☐	☐

2. Which of the following influence a company's approach to health and safety?

Factor Affecting Company's Health & Safety	Strong influence	Some influence	No influence	Not sure
The specification of the job	☐	☐	☐	☐
Legal requirements	☐	☐	☐	☐
Health and safety practices of competitors	☐	☐	☐	☐
Requirements from professional bodies or trade Associations	☐	☐	☐	☐
Views of the Company Directors	☐	☐	☐	☐
Union demands	☐	☐	☐	☐
Employee wishes	☐	☐	☐	☐
Insurance requirements	☐	☐	☐	☐

Owners/shareholders/investors	☐	☐	☐	☐

3. How strongly do you agree or disagree with these statements?

Health & Safety Issues	Strongly agree	Agree	Agree a little	Unsure	Disagree a little	Disagree	Strongly disagree
1.The construction sector believes its safety performance is satisfactory	☐	☐	☐	☐	☐	☐	☐
2.The health and safety problems inherent in construction activities make it difficult to improve health and safety performance	☐	☐	☐	☐	☐	☐	☐
3.Professional qualifications for engineers/designers/architects/quantity surveyors prepare them to deal with real health and safety issue	☐	☐	☐	☐	☐	☐	☐
4.Qualification for building trades cover health and safety thoroughly	☐	☐	☐	☐	☐	☐	☐
5.Existing law and regulations clearly define health and safety requirements	☐	☐	☐	☐	☐	☐	☐
6.Companies in the construction sector consider their health and safety performance to be important to commercial success	☐	☐	☐	☐	☐	☐	☐
7.Large firms take health and safety more seriously than small firms	☐	☐	☐	☐	☐	☐	☐
8.The costs of managing health and safety are too great for small and medium sized companies	☐	☐	☐	☐	☐	☐	☐
9.Companies do not seriously prevent health and safety incidents because they rely on insurance policies to cover claims	☐	☐	☐	☐	☐	☐	☐
10.When construction work is scarce, health and safety is cut back like other costs, so as to keep competitive	☐	☐	☐	☐	☐	☐	☐
11.Keeping competitive means companies can't effort to invest in health and safety training	☐	☐	☐	☐	☐	☐	☐
12.Most projects have short or inadequate schedules which have negative impact on health and safety	☐	☐	☐	☐	☐	☐	☐
13.The sooner the client appoints the principle contractor the safer the project will be	☐	☐	☐	☐	☐	☐	☐
14.Working constantly with the same set of contractors/ sub-contractors etc. improves health and safety performance	☐	☐	☐	☐	☐	☐	☐
15.Architects, engineers and quantity surveyors have nothing to gain from being fewer accidents	☐	☐	☐	☐	☐	☐	☐

16.The division of tasks between designers, contractors, etc. makes it difficult to manage health and safety	❑	❑	❑	❑	❑	❑	❑
17.The cost of improving health and safety performance exceeds the benefits to be gained	❑	❑	❑	❑	❑	❑	❑
18.The construction industry is unique, and you can't use health and safety management methods tried in other industries	❑	❑	❑	❑	❑	❑	❑
19.Spending money on managing construction health and safety saves money on the long run	❑	❑	❑	❑	❑	❑	❑
20.'Partnering' can improve construction health and safety	❑	❑	❑	❑	❑	❑	❑
21.The specification from the client determines how well health and safety is managed on the project	❑	❑	❑	❑	❑	❑	❑
22.A co-operative relationship between client and lead contractor is critical to good health and safety management	❑	❑	❑	❑	❑	❑	❑
23.The size and complexity of the project(e.g. no. of sub-cons) influences how well health and safety is managed	❑	❑	❑	❑	❑	❑	❑
24.The health and safety of high profile projects are always well managed	❑	❑	❑	❑	❑	❑	❑
25.Method statements do not include sufficient information on how to do the job safely	❑	❑	❑	❑	❑	❑	❑
26.It is difficult to manage safety if there are too many changes to the plan of work	❑	❑	❑	❑	❑	❑	❑
27.Project with severe budget pressures will be unsafe	❑	❑	❑	❑	❑	❑	❑
28.A project that runs into schedule pressures will pay less attention to health and safety	❑	❑	❑	❑	❑	❑	❑
29.A project with a large number of self-employed workers is likely to have more accidents	❑	❑	❑	❑	❑	❑	❑
30.The more experienced the management team, the better will be the health and safety of the project	❑	❑	❑	❑	❑	❑	❑
31.The more experienced the work force, the better will be the health and safety of the project	❑	❑	❑	❑	❑	❑	❑
32.Planning Supervisors help improve health and safety	❑	❑	❑	❑	❑	❑	❑
33.It is possible to foresee and remove health and safety problems during the design and planning stages	❑	❑	❑	❑	❑	❑	❑

34.It is possible to foresee and remove health and safety hazards to workers from the construction drawings and schedule of work	❑	❑	❑	❑	❑	❑	❑
35.Designers leave it to others to find safe ways of constructing their design	❑	❑	❑	❑	❑	❑	❑
36.Design changes or changes to the plan of work, during construction create safety problems	❑	❑	❑	❑	❑	❑	❑
37.All health and safety problems that occur during construction can be resolved on site	❑	❑	❑	❑	❑	❑	❑
38.Site managers look out for health and safety problems and are quick to correct them	❑	❑	❑	❑	❑	❑	❑
39.The attitude of site managers to health and safety is dependent on the attitude of their senior management	❑	❑	❑	❑	❑	❑	❑
40.Supervisors/foremen ensure their workers are working properly	❑	❑	❑	❑	❑	❑	❑
41.Workers know more about safety than management	❑	❑	❑	❑	❑	❑	❑
42.It is difficult to convince sub-contractors to work safely	❑	❑	❑	❑	❑	❑	❑
43.Self-employed workers are more at risk than others	❑	❑	❑	❑	❑	❑	❑
44.Site managers should have a very good understanding of health and safety	❑	❑	❑	❑	❑	❑	❑
45.Client representatives should convince the client about the importance of health and safety so that the client is ready to invest more in health and safety	❑	❑	❑	❑	❑	❑	❑
46.It takes an accident to occur on a project before health and safety is taken seriously	❑	❑	❑	❑	❑	❑	❑
47.The only reason for writing health and safety rules and manuals is to satisfy legislation	❑	❑	❑	❑	❑	❑	❑
48.An in –experience client does not understand the importance of health and safety to the overall success of the project	❑	❑	❑	❑	❑	❑	❑
49.Design-build project gives better chance for all parties to seriously thought about health and safety of a project in the early design stage	❑	❑	❑	❑	❑	❑	❑
50. The attitude of the leader in the production team will have significant impact on the safety culture of the whole team in a project.	❑	❑	❑	❑	❑	❑	❑

51.Construction workers accept that poor health and safety conditions are part of the job	❑	❑	❑	❑	❑	❑	❑
52.Attitudes of workers to health and safety are strongly influenced by their training / qualification	❑	❑	❑	❑	❑	❑	❑
53.The construction industry does not about the long term health f its workers	❑	❑	❑	❑	❑	❑	❑

C. Your views of recent changes in the construction sector

1. Has there been a change regarding construction health and safety in the last few years in any of the following:

The Changing of Safety & Health	Large improvement	Some improvement	No change	Some worsening	Large worsening	Not sure
1.Level of co-ordination on health and safety within project	❑	❑	❑	❑	❑	❑
2.Acceptance of responsibility by management	❑	❑	❑	❑	❑	❑
3.Using procurement method which involves main contractor in the early design stage e.g. design-build	❑	❑	❑	❑	❑	❑
4.Degree of worker consultation (in site practices)	❑	❑	❑	❑	❑	❑
5.Health and safety in planning construction activities	❑	❑	❑	❑	❑	❑
6.Reporting of accidents	❑	❑	❑	❑	❑	❑
7.Client involvement	❑	❑	❑	❑	❑	❑
8.Enforcement of health and safety rules	❑	❑	❑	❑	❑	❑
9.The health and safety well-being of construction workers	❑	❑	❑	❑	❑	❑

2. Do you believe there has been a change in the understanding of construction health and safety risks by:

Project Participants	Large improvement	Some improvement	No change	Some worsening	Large worsening	Not sure
Clients	❑	❑	❑	❑	❑	❑
Designers/ consultants	❑	❑	❑	❑	❑	❑

Planning Supervisors (UK Only)	❑	❑	❑	❑	❑	❑
Head –office Management	❑	❑	❑	❑	❑	❑
Project Management	❑	❑	❑	❑	❑	❑
Site Management	❑	❑	❑	❑	❑	❑
Site Supervisors	❑	❑	❑	❑	❑	❑
Construction Workers	❑	❑	❑	❑	❑	❑

2. Do you believe there has been a change in the following:

The Changing of Health & Safety	Large increase	Some increase	No change	Some decrease	Large decrease	Not sure
No of fatal/major accidents	❑	❑	❑	❑	❑	❑
Proportion of project allocation for health and safety	❑	❑	❑	❑	❑	❑
Health and safety regulations	❑	❑	❑	❑	❑	❑
Site enforcements by the authority	❑	❑	❑	❑	❑	❑

3. Could any of the following bring improvements in the construction health and safety?

Improved Health & Safety	Could bring big benefit	Some benefit	No change	Could worsen	Not sure
More use of partnering/ alliancing arrangement	❑	❑	❑	❑	❑
More effort into planning a project before construction	❑	❑	❑	❑	❑
More time during construction to assess health and safety issue	❑	❑	❑	❑	❑
More health and safety training courses	❑	❑	❑	❑	❑
More health and safety input in professional courses in institution of higher learning	❑	❑	❑	❑	❑
More pre-fabrication materials for projects	❑	❑	❑	❑	❑
Greater penalties	❑	❑	❑	❑	❑
Prosecution of Directors	❑	❑	❑	❑	❑
Corporate manslaughter	❑	❑	❑	❑	❑
Best Value for Money concept rather than lowest cost	❑	❑	❑	❑	❑
Clearer regulations	❑	❑	❑	❑	❑

5. Realistically, how much scope do the following have to improve construction health and safety?

Stakeholders	**Large scope**	**Some scope**	**No scope**	**Not sure**
Government	❑	❑	❑	❑
Clients	❑	❑	❑	❑
Contractor Management	❑	❑	❑	❑
Inspectors	❑	❑	❑	❑
Designers/consultants/planning supervisors	❑	❑	❑	❑
Project management	❑	❑	❑	❑
Site management	❑	❑	❑	❑
Safety advisors	❑	❑	❑	❑
Supervisors/foremen	❑	❑	❑	❑
Construction workers	❑	❑	❑	❑
Professional institutions	❑	❑	❑	❑
Trade associations	❑	❑	❑	❑
Insurers	❑	❑	❑	❑

Thank you very much for your cooperation. For internal validation purpose please sign, strict confidentiality is adopted for this study and in no way your identity will appear in the final write- up of the thesis.

Name :.....

Signature :.....

Date :.....

APPENDIX B: FIELDWORK FORMS

A. CONTRACTOR

How does the contractor think about H&S?

- *Does the client provide* **sufficient information** *to prepare for the post contract health and* safety plan*?*

- Does ***safety record*** have ***significant influence*** on the ***success of the bidding*** for this project?

- Are all sub-contractors and suppliers given **adequate instructions** or information regarding your company's health and safety policy to ensure they understand your company's stand regarding health and safety?

- What do your opinion? If the main contractor is **involved** in the **early stages of design** e.g. in design –build contract, then the main contractor can give **more significant** input in the design in respect to the health and safety.

- Does the client's health and **safety policy** in this project have **significant impact** on the **overall success** in term of health and safety of the project?

- Does the **implementation of health and safety** for this project have a **significant impact** on the **overall cost** of the project?

- In the **open tender process,** is the contractor in dilemma to **allocate more money** for health and **safety** because this might **jeopardise** the chance of **winning** the tender?

- What is the rating of the **client's influence** in the implementation of health and safety in this project at the **design stage**?

- What is the rating of the **client's influence** in the implementation of health and safety in this project at the **construction stage**?

- Is the **involvement of the client** on site important? And does their **regular site visits** and have direct communication with the operators will have **great impact on their safety behaviours**?

- How **difficult** is to ensure every worker on site **follow all the safety regulations** especially regarding the wearing of safety hat and boots all the time despite their knowledge about the regulations?

B. SAFEETY OFFICER

How does the safety officer think about?

- How do the **completed drawings and specifications** help the contractor to plan health and safety for the project in detail, including adequate cost consideration for the health and safety?

- How important is the contractor to be **involved** in the early **stages of design** and give some input in relation to health and safety of the project?

- How significant is the **client's role** in ensuring all parties are serious in **implementing health and safety** in the project?

- How important is the **safety record** used as **lessons learned** by the contractor?

- How important is the **client in leading the team** to ensure everybody plays their role in the implementation of health and safety during the design stage of the project?

- Is the **standard of health and safety** implemented on site influenced by **contractor's tender price**? Is the lower tender prince, the lower the standard applied?

- How can the **client's health and safety policy** affect the project participant taking into account serious thought about doing the project safely?

- How important is the main-contractor commitment in influencing their sub-contractors performance on health and safety?

C. DESIGNER

How does the designer think about H&S?

- How does the designer fully understand the importance of considering health and safety in all their designs including the design for this project?

- Was health and safety plan for this project based on the detailed design and specification? And is the safety plan a good basis for the contractor to price the job without compromising on health and safety?

- How important is the client's role and influence in ensuring all parties are serious in implementing health and safety in the project?

- How does the safety record of the contractor affect the selection consideration during the tendering process?

- How important is the contractor able to be involved in the early stages of design and give some inputs in relation to health and safety of the project?

- How will the selected contractor's tender price affect the standard of health and safety on site?

- How important is the team integration for better design product in order to achieve the client's objectives?

- How much influence does the designer have on the overall health and safety of the project implementation?

- How much do health and safety cost have significant impact on the overall cost of the project?

D. QUANTITY SURVEYOR

How does the quantity surveyor think about Health & Safety?

- How significant does the provision for health and safety in this project have implication on the total cost of the project?

- How important is the detailed design and specification to be used as a good basis for the contractor to price the job without compromising on health and safety?

- How significant is the client's role and influence in ensuring all parties are serious in implementing health and safety in the project?

- How does the safety record of the contractors affect on the selection process of contractors in the tendering process?

- How important does the contractor have opportunity to be involved in the early stages of design and give some inputs in relation to health and safety of the project?

- How will the selected contractor's tender price affect the standard of health and safety on site?

- How important is the team integration for better design product to achieve the client's objectives?

- How much does the design-build method provide the contractor to give input regarding health and safety earlier in the design stage and this will minimise problems during the construction stage?

E. THE CLIENT'S AGENT

- You have been appointed by the client based on your experience and close working relationship with the client for a long time. Can this be regarded as a 'partnering concept'?

- Does the client have a clear procurement policy for this project? And has the client given you clear instructions to follow to ensure the success of the project?

- How are the agent given the full mandate to manage the project and this includes the provision of a procurement strategy for the project?

- Does the schedule and budget have considerable impact on the type of procurement adopted for this project?

- How does the early involvement of the main contractor make it more chance of completing the project within time and budget?

- How important is the early involvement of all parties in the early stage makes it easier to ensure that the health and safety of the project is taken care of in the design stage?

- What is the degree of importance the safety record of the contractors in the selection process for this project?

- Is the freedom of choice of consultants by the main contractor makes it easier to work as a team in this project?

- Compare to the traditional type of tendering, is the two-stage tendering adopted in this project more successful in working as a team right from the early stages and this greatly enhances the chance of success in terms of time, quality and cost?

- As the client's agent and the leader of the production team how much influence do you have on the overall health and safety of the project?

- Although you have no direct contact with the sub-contractors and suppliers, Can the client's agent be very influential in ensuring they have high standard of health and safety practise during the project?

- What is your rating for the integration of the team in this project-particularly when using the procurement strategy you have adopted?

- What is your rating concerning the client in relation to their contribution, input to assist you in the overall success of the project.

- How important is the client's role and influence in ensuring all parties are serious in implementing health and safety in the project?

- How important does the client influence on the health and safety issues and provides significant input during the design stage?

- Does the two-stage tendering/ negotiated design-build procurement method for this project have positive for team integration and provides better cooperation from all parties early in the design stage?

THE RESPONDENTS:

1. **CONTRACTOR**
2. **DESIGNER**
3. **QUANTITY SURVEYOR**
4. **CLIENT'S AGENT**
5. **SAFETY OFFICER**

A. During the production process for this project, give your rating for the following activities that help in the successful implementation of health and safety for the project.

Rating: 1-10

No.	Activity	Rating
1	Client' brief or client's specification	
2	Selection of main contractor	
3	Type of procurement strategy	
4	Preparation of Pre-tender health and safety plan	
5	Construction method or method statement	
6	Selection of consultants by contractor	
7	Selection of sub-contractors and suppliers	
8	Input by client during construction	
9	Daily and weekly health and safety report by site supervisor	
10	Inspection by Health and Safety Authority (if any)	

B. Rate the following personal according to their influence regarding health and safety in this project.

No.	Personal Influence to H & S	Rating
1	The client's agent	
2	The contract's manager	
3	The Planning Supervisor	
4	HSE health and safety inspector	
5	Designers	
6	The client	

C. Good leadership is critical for the success of any project. Please rate using the scale of 1 to 10 the team leader in this project against the following qualities.

No.	Qualities	Rating
1	Enthusiast	
2	Champion of change	
3	Good communicator	
4	Leads by example	
5	Open	
6	Risk tolerant	
6	Visionary	
7	Motivator, failure tolerant	
8	Good delegate	

APPENDIX C: CASE STUDY 1

The Project: Helsby High School Drama and 6th Form Block. Chester Road, Helsby, Cheshire WA6 0HY

This is a construction of a self-contained block to an existing high school. The construction period is 13-months with a budget of 600,000 British Pounds. The sum includes professional fees and the *not to exceed price criteria* for this project becomes a big challenge for all parties.

The client for this project is The Cheshire County Council who provides 40 per cent of the funding and the School Board is the end user who provides 60 per cent. All the necessary requirements and input for design is provided by the school right from initial stage to completion. The school is given the mandate to be involved during the design stage and also construction stage and the County Council has very little input but will be referred to when needed during the process.

The Cheshire County Council appoints an agent or termed as *employer's agent* to manage the project. The employer's agent is a quantity surveying consulting firm which has very good record and has done a lot of projects with the Cheshire City Council. The employer's agent is given the mandate to implement a procurement strategy that will meet the challenge of completing the project which has a tight completion schedule and limited budget.

The employer's agent has decided on a design-built strategy for the project. The choice of contractor is totally done by the County Council where three pre-qualified contractors were invited to submit their proposals. Each contractor has their own scheme of design done by their team of consultants. The agent's responsibility is to choose the best according to the requirements of the project importantly the cost and budget.

Case study data documentation

The methods used to gather data and information for this case study are: interview, document search, and questionnaire and site observation.

Interview: Architect

A) General - The project

1. What is your experience in handling construction projects and is this project unique or is it just another project handled by you?
   Just another job. Has 6 years of experience, with this kind of project, small not more than £1 M

2. What stage is the project now, and are you satisfied with its progress relating to quality and time?
   Foundation stage. Yes. A bit a head of schedule.

3. What about health and safety aspect, if the construction period has started, is there any incident to be reported?
   No

4. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   Not really. Possibility is there if time is not up to schedule. Budget is not a major problem.

5. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   From the Planning Supervisor himself, right from early meetings.

6. Is there any benchmark for the project in term of health and safety?
   Yes, zero accident.

7. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   The design team. They should be the main drivers. Together with the contractor, they should work for safety

8. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes, since has attended some courses relating to health and safety.(showed materials from course attended).

9. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Yes, on individual initiatives. Not only for this project, but to enhance personal knowledge.

10. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
    Adequate time.

11. Are you satisfied with your knowledge regarding the health and safety legislation, especially the implementation of CDM?
    Yes, after attending the courses.

12. Do you think doing this project safely will affect quality and productivity?
    Yes, safety works along side with quality and safety.

B) The role of the client relating to health and safety (Proposition 1).

13. Are you satisfied with the client's input regarding health and safety in order to help you with the design of this project?
    Not from the 'real' client but from the designers and main contractor.

14. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
Knowledge. The client does not know about the technicality of the project.

15. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
No. But in this case the school teachers give input on how to control the students from getting near the site and type of finishes they want which is quite helpful in choosing the right material with some consideration for safety.

16. Are you satisfied with the role as the client in ensuring all members of the team play their part concerning health and safety?
The client representative, in this case the planning supervisor who is from the main contractor's site is very concern about health and safety, and yes, I am satisfied.

17. Who is in charge of ensuring that the project complies with the health and safety regulations?
There are two. One in the design stage-Mr. Lawrence from client and construction stage Mr. Michael Conlon from Conlon construction.

18. At which stage of the production process does the client give strong concern about health and safety?
At the final stage of the design and starting of the construction phase.

19. Is there any a meeting or discussions initiated by the client regarding health and safety?
Not specific. Health and safety issues included in site meetings.

20. Does the client rely entirely on the Planning Supervisor to advice him about health and safety?
Yes.

21. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
Yes, if knowledgeable.

22. Do you believe that the client understand the relationship between health and safety and quality of this project?
Client and representative, yes.

C) Procurement as a driver for health and safety (Proposition 2).

23. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
Yes from the scale of 10, I will give 7-8.

24. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
Yes, about 75%.

25. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
The project manager, yes together with quality and productivity.

26. Does your organisation have a clearly defined policy concerning health and safety?
No, there is no written policy.

27. Do you organisation has any safety record/policy that might help the client in assessing your health and safety record regarding the design of projects?
Every project we do risk assessment, and this can be a record of our safety concern.

28. In the selection criteria of the main contractor, how significant is their safety record?
Very significant. There is a form called competency form which contractor has to fill in.

29. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
Yes, this can take place for e.g. records of many days, hours work done without accidents and the workers can be 'rewarded' by recognition by the employers.

30. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
In the initial stage, there should be a written policy regarding health and safety.

31. Do you think more money should be allocated to care for health and safety in this project?
This is a small project, the budget is good enough to take care of health and safety.

32. Do the drawings and specifications have clear instruction regarding health and safety?
Not in the drawings but in the risk assessment report.

33. How would you define good /best practise as used in health and safety management?
To have proper policy.

34. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
In this project the project manager choose the type of procurement strategy. Need to ask them.

35. Do you refer to the UK government procurement guidance in achieving value for money (vfm) in this project?
Not sure.

36. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes, very impressed.

37. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Too early to say.

38. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Crucial.

39. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method		x			
Selection of contractor	x				
Selector of designers		x			
Pre-qualification (if any)	x				
Drawings and specifications		x			

40. Do you think procurement is a better driver than legislation in improving health and safety?
Legislation as the main driver and procurement can be an effective tool for implementation.

41. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes.

42. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Contract policy. Make them sign a contract with clear policy on health and safety.

43. If there are any changes in design or specification of this project, is the issue of health and safety being considered?
Yes. e.g. the change of floor finishes has to consider safety for end users.

D) Team Integration in promoting health and safety (Proposition 3)

44. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

45. Are you satisfied the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes, from the client's representative.

46. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

47. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
All through the design stage.

48. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes.

49. Does the Planning Supervisor request for feed- back or information from other team members in order to prepare the safety file?
Yes.

50. Is there any meetings, discussions in the early stages of the production process among team members regarding health and safety?
Yes.

51. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraints.

52. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
Not necessary in this project.

53. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
Not so obvious in this project because of the size.

54. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
Not so much in this project.

55. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
The project is too small to have the need to do so.

56. As designers you would like more input from contractors and sub-contractors concerning health and safety to assist you in your design. Do you agree?
Yes, helpful in the installation process.

57. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No.

58. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
No, not yet.

59. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
Yes, zero accident.

Interview: Employer's Agent

A) General - The project

1. What is your experience in handling construction projects and is this project unique or is it just another project handled by you?
It can be considered as a small job and quite routine, time and cost can be considered as a bit tight.

2. What stage is the project now, and are you satisfied with its progress relating to quality and time?
They have completed the foundations and it seems right on tract and so far I am satisfied with the quality.

3. What about health and safety aspect, if the construction period has started, is there any incident to be reported?
No

4. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
It is a small job, I don't think safety is a problem.

5. Is there any specific instruction from higher authority to ensure that the project should be built safely?
There is no specific instruction but all parties are very familiar with the regulations concerning health and safety.

6. Is there any benchmark for the project in term of health and safety?
Every job we want to have a good record.

7. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Once the contractor has been appointed we expect them to work together with other team members regarding health and safety.

8. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Personally I have attended several courses and, yes, I think I am ok. I don't give direct instruction regarding health and safety in this project-the planning supervisor takes care of that issue.

9. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Not particularly for this project

10. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
    I am not directly involved, and I don't see any constraints.

11. Are you satisfied with your knowledge regarding the health and safety legislation, **especially the implementation of CDM?**
    Yes

12. Do you think doing this project safely will affect quality and productivity?
    Yes, if quality, productivity I am not sure.

B) The role of the client relating to health and safety (Proposition 1).

13. Are you satisfied with the client's input regarding health and safety in order to help you with the design of this project?
    As the client's agent, we need input from the end-user, the school-they have given several comments related to their requirements and that effects safety too.

14. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    The school concerns more of their requirements of space, functions but in term of safety very minimum input because technically they do not know much to be of any help.

15. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    Not the technical things but they are concern about the safety of their students during construction and they work together with the contractor to ensure safety.

16. 16 Are you satisfied with the role as the client in ensuring all members of the team play their part concerning health and safety?
    The contractor has so far has done his job-and close monitoring done during construction. As the client's agent we make sure safety being taken care of during site meetings an agenda concerning safety is mandatory.

17. Who is in charge of ensuring that the project complies with the health and safety regulations?
    During tendering stage we take care and construction stages; the contractor.

18. At which stage of the production process does the client give strong concern about health and safety?
    At safety plan stage and ensuring contractor at construction stage.

19. Is there any meeting or discussions initiated by the client regarding health and safety?
    Only at site meetings

20. Does the client rely entirely on the Planning Supervisor to advice him about health and safety?
    Yes.

21. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Good enough for this project.

22. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Yes.

C) Procurement as a driver for health and safety (Proposition 2).

23. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    Yes , this is not a complicated job.

24. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Yes

25. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    We, the employer's agent after discussion with the Council.

26. Does your organisation have a clearly defined policy concerning health and safety?
    No, there is no written policy.

27. Do you organisation has any safety record/policy that might help the client in assessing your health and safety record regarding the design of projects?
We are a quantity surveying firm-not that relevant

28. In the selection criteria of the main contractor, how significant is their safety record?
They have been pre-qualified by the Council which has their own criteria concerning the safety record of the contractor.

29. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
It is up to the contractor to implement to their workers-incentive on our part to the contractor, is that they will have a clean record.

30. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
Good enough, the two-stage tendering process has taken care of safety issue and the listed contractors that have a good record.

31. Do you think more money should be allocated to care for health and safety in this project?
No need

32. Do the drawings and specifications have clear instruction regarding health and safety?
The risk assessment report by the architect is good enough

33. How would you define good /best practise as used in health and safety management?
The whole team knows their responsibility and ready to improve together.

34. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
The two-stage tendering and the Council's pre-qualification of contractors.

35. Do you refer to the UK government procurement guidance in achieving value for money (vfm) in this project?
Not really

36. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes

37. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Maybe the input from school to be more specific at the beginning.

38. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Yes

39. During the procurement process, what is their contribution concerning health and safety in this project?

40.

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method	x				
Selection of contractor	x				
Selector of designers		x			
Pre-qualification (if any)	x				
Drawings and specifications		x			

41. Do you think procurement is a better driver than legislation in improving health and safety?
Through procurement you can find opportunities to implement what is need by legislation

42. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Not that significant but it helps.

43. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Main contractors must ensure that their sub-contractors and suppliers has the same concern.

44. If there are any changes in design or specification of this project, is the issue of health and safety being considered?
A few changes as recommended by the school e.g. the material for floor.

D) Team Integration in promoting health and safety (Proposition 3)

45. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

46. Are you satisfied the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes

47. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

48. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Design stage, sometimes during construction.

49. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes.

50. Does the Planning Supervisor request for feed- back or information from other team members in order to prepare the safety file?
Yes.

51. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Yes.

52. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
This is a straight forward job, no problem.

53. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
Not yet

54. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
They work together well, and procurement method used is ok

55. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
Not in this project

56. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No need in this project

57. As designers you would like more input from contractors and sub-contractors concerning health and safety to assist you in your design. Do you agree?
Not relevant

58. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No.

59. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
No

60. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
We expect and hope no incident.

Interview: Employer's Agent

Structured Questionnaires to key-players in the school project
The questions are designed differently for different correspondent based on their job and relevance in the safety issue.

Case Study One:
Please rate the respond that best describes your opinion on the following:

1. You have been appointed by the client i.e. The Chester County Council based on your experience and close working relationship with the Council for a long time and this can be regarded as 'partnering concept'.
Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

2. The client has a clear procurement policy for this project and has given you clear instructions to follow to ensure the success of the project.
Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree
Any further comment:
There was a need for the project to be tendered and the council identified a requirement for Design and Build. The basis of the tender documents was identified by us.

3. You as the client's agent are given the full mandate to manage the project and this includes the provision of a procurement strategy for the project.
Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
Any further comments:
Budget constraints held by client.

4. The schedule and budget have considerable impact on the type of procurement adopted for this project.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

5. The early involvement of the main contractor makes it more chance of completing the project within time and budget.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

6. The early involvement of all parties in the early stage makes it easier to ensure that the health and safety of the project is taken care of in the design stage.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

7. What is the degree of importance the safety record of the contractors in the tendering process for this project?
   Rating: 1. Nil 2. Little Significant 3. Significant 4. Very Significant
   Not known. Tenderers selected by Chelshire County Council.

8. The freedom of choice of consultants by the main contractor makes it easier to work as a team in this project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

9. Any further comment:
   Yes-for the contractor. These consultants still have to work with the client's team.

10. Compare to the traditional type of tendering, the two-stage tendering adopted in this project is more successful in working as a team right from the early stages and this greatly enhances the chance of success in terms of time, quality and cost.
    Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

11. As the client's agent and the leader of the production team how much influence do you have on the overall health and safety of the project?
    Rating: 1. **Nil** **2.Little Significant** 3. Significant 4. Very Significant

12. Although you have no direct contact with the sub-contractors and suppliers, as the client's agent you can be very influential in ensuring they have high standard of health and safety practise during the project.
    Rating: **1. Disagree** 2. Agree a little 3. Agree 4. Strongly agree
    Responsibility lies with the Contractor who we can influence. Success at this can vary greatly.

Respondent: Site Agent
Please rate the respond that best describes your opinion on the following:

1. Good leadership is critical for the success of any project. Please rate using the scale of 1 to 10 the team leader in this project against the following qualities.
   Scale: 1. Lowest. - 10. Highest

Qualities	Rating
Enthusiast	9
Champion of change	7
Good communicator	9
Leads by example	8
Open	8
Risk tolerant	1
Visionary	8
Motivator, failure tolerant	10
Good delegate	8

2. Rate the following personal according to their influence regarding health and safety in this project.
   Rating: 1-10

Personal	Rating
The client's agent	8
The contract's manager	9
The Planning Supervisor	10
HSE health and safety inspector	10
Designers	8
The client	7

3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure

4. During the construction stage, the client's agent can have more impact on the safety culture of the workers by direct contact e.g. dialog, discussion with the site operators regarding health and safety.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure

5. Although there are clear health and safety instruction on site, sometimes, the workers still do not wear safety gears.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure
   Regular job to chase site operatives to wear p.p.e. (personnel protective equipment)

6. Using the rating of 1-10, what is the condition of health and safety for this site?
   Rating:.....8.....

7. Doing the job safely will have positive impact on the quality of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure

8. The end user, i.e. the school has given significant input to ensure safety for all during construction by attending all site meetings.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure

9. What type of actions can be taken to ensure all site operators abide health and safety regulations all the time? Please rate the following actions.
   Rating: 1-10

Actions	Rating
Occasional training	9
Warnings and Fines	8
Work suspension	8
Regular safety meetings	7
Award or incentive scheme	8

10. It is easier to talk to the leader of a trade worker e.g. the leader of a group of bricklayers than the workers themselves regarding health and safety.
    Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure

11. The two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage.
    Rating: 1. Disagree 2. Agree a little 3. Agree 4. Strongly agree

Respondent: Architect

Please rate the respond that best describes your opinion on the following:

1. The main contractor has chosen you to be his designer due to long term working relationship.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure
   Our practice has worked well with main contractor in the past and we have had a good understanding of the practices of both company

2. The time given for submitting the first proposal during the first stage of tendering is sufficient to consider the health and safety aspects of the project.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure
   First proposal submission – has usually only considered on its design merit on principally on its safe construction which develops later

3. The information given by the client's agent is good enough for you to submit a good proposal with due regard to health and safety.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure
   As professionals we should be considerate of health and safety always.

4. Who has greater influence regarding health and safety in this project, the client's agent or the main contractor?
   Answer: **Main contractor**
   It is true main contractor who will construct the scheme and then they will produce method statements, etc. However it is the clients overall responsibility for safety issue.

5. Good leadership is critical for the success of any project. Please rate using the scale of 1 to 10 the team leader in this project against the following qualities.
   Scale: 1. Lowest. - 10. Highest

Qualities	Rating
Enthusiast	10
Champion of change	8
Good communicator	9
Leads by example	10
Open	7
Risk tolerant	6
Visionary	8
Motivator, failure tolerant	8
Good delegate	9

6. Rate the following personal according to their influence regarding health and safety in this project.

Personal	Rating
The client's agent	9
The contract's manager	9
The Planning Supervisor	10
HSE health and safety inspector	4
Designers	8
The client	7

7. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure
   Many clients do not have an understanding of construction so they are reliant on professionals for advice. They should however not absolve themselves from any interest in health and safety.

8. The freedom of choice of consultants by the main contractor makes it easier to work as a team in this project.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**
   Once the main contractor has established good working relationships with particular consultants it makes good sense to build on recognised working practices rather than learning the ways of individual consultants each time.

9. The two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**
   It has been reasonably easy to share information and highlight points of conflict particularly within design.

10. What is your rating for the integration of team in this project ? 1-10
    Rating: 9
    The project has run smoothly throughout its duration largely down to the integration of the team rather than sets of individuals.

11. What is your rating concerning the client (The Chester City Council) in relation to their contribution, input to assist overall success of the project.
    Rating : 1-10 : 7 ½
    The have taken a 'back seat' throughout the project. However they have made comments as they have seen the need too. It is quite nice to think they 'trust' the team on this project.

12. During the production process for this project, give your rating for the following activities that help in the successful of health and safety for the project.
    Rating: 1-10

Activity	Rating
Client's brief or client's specification	8
Selection of main contractor	8
Procurement strategy	7
Preparation of Pre-tender health and Safety Plan	10
Method statement by main contractor-health and safety plan	8
Selection of consultants by contractors and suppliers	9
Input by client during construction	10
Daily and weekly health and safety report by site supervisor	8
Inspection by HSE	5

APPENDIX D: Case Study 2

The project: refurbishment/renovation of early 20th century terraced housing in private ownership totalling 60 properties.

The project is the refurbishment of old terraced houses involving the repair to the external envelope of all the properties and some internal modernization of some of the properties. Total cost of the project is 1.5 million pounds and the duration is 41 weeks. The client is the local city council while the client's agent who undertakes all the procurement process is the architectural and landscape design section of the local council. This section is responsible for the design and tendering process together with a planning supervisor who is charge of the health and safety requirement of the project. The engineering design is entrusted to the engineering works designer section of the council.

This project is being procured by the traditional method using the Intermediate Form of Building Contract 1998 Edition. Six (6) contractors bid for the job and the lowest tenderer was selected for the job. The lowest tender cost is about 12 % from the estimate made by the quantity surveyor.

The city council has an established health and safety policy and for this particular case, the relevant code of practice issued to the contractor is the Part 1 of code of Practice (K) which is part of the council's health and safety policy arrangement. This code of practice is concerning maintenance work. The fact that this case involves maintenance of terraced housing with occupants, the essence of this code of practice is to ensure the safety of the occupants and bypassers.

Interview: Project Architect-Group Leader

A) General - The project

1. What is your experience in handling construction projects and is this project unique or is it just another project handled by you?
   Just another job, but renovation work is quite challenging especially involve public

2. What stage is the project now, and are you satisfied with its progress relating to quality and time?
   Half-way, everything seems ok

3. What about health and safety aspect, if the construction period has started, is there any incident to be reported?
   No

4. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   Budget is not a problem, but time maybe.

5. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   The client, in this case the council entrusted the design team

6. Is there any benchmark for the project in term of health and safety?
   In any project, we expect zero incidents

7. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Designers has to ensure that contractors know their responsibility

8. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes, in the local council we do have briefings on safety

9. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Not specific but general training relating to CDM

10. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
    Adequate time.

11. Are you satisfied with your knowledge regarding the health and safety legislation, especially the implementation of CDM?
    Yes, after attending the courses.

12. Do you think doing this project safely will affect quality and productivity?
    Yes, any mishaps will adversely affect the job

B) The role of the client relating to health and safety (Proposition 1).

13. Are you satisfied with the client's input regarding health and safety in order to help you with the design of this project?
    The client is not technically aware-our department is fully responsible but the client has clear safety policy.

14. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Again, lack of technical knowledge.

15. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    No. They totally rely on technical department.

16. Are you satisfied with the role as the client in ensuring all members of the team play their part concerning health and safety?
    They totally rely on the designers to ensure that the contractor knows their duty

17. Who is in charge of ensuring that the project complies with the health and safety regulations?
    We employ independent safety official and the contractor has its own safety official

18. At which stage of the production process does the client give strong concern about health and safety?
    We as the client's agent look at the design and also the safety plan stage.

19. Is there any a meeting or discussions initiated by the client regarding health and safety?
    No, the client will ensure that the contractors tendering for the project are listed contractors

20. Does the client rely entirely on the Planning Supervisor to advice him about health and safety?
    Yes.

21. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Without technical knowledge not much can be given.

22. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Client understands the importance of safety-not relative to quality.

C) Procurement as a driver for health and safety (Proposition 2).

23. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    Yes

24. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Yes

25. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    This is an ordinary job- traditional tender is good enough

26. Does your organisation have a clearly defined policy concerning health and safety?
    The council has

27. Does your organisation have any safety record/policy that might help the client in assessing your health and safety record regarding the design of projects?
Not relevant-design department under client's organisation)

28. In the selection criteria of the main contractor, how significant is their safety record?
All are listed contractors meaning they have good safety record. In this case not that ***significant.***

29. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
Yes

30. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
Submission of safety plan

31. Do you think more money should be allocated to care for health and safety in this project?
No need

32. Do the drawings and specifications have clear instruction regarding health and safety?
In the risk assessment report.

33. How would you define good /best practise as used in health and safety management?
A clear policy on safety and clear responsibilities of all parties

34. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
Clear safety plan

35. Do you refer to the UK government procurement guidance in achieving value for money (vfm) in this project?
Not really

36. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes

37. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Not sure

38. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Yes

39. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method		x			
Selection of contractor	x				
Selector of designers		x			
Pre-qualification (if any)	x				
Drawings and specifications		x			

40. Do you think procurement is a better driver than legislation in improving health and safety?
Both equal

41. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes.

42. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Make sure main contractor has safety contract with them

43. If there are any changes in design or specification of this project, is the issue of health and safety being considered?
No.

D) Team Integration in promoting health and safety (Proposition 3)

44. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

45. Are you satisfied the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
We as the client's agent is the leader and we are satisfied

46. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

47. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
All through the design stage.

48. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes.

49. Does the Planning Supervisor request for feed- back or information from other team members in order to prepare the safety file?
No

50. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
A little

51. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraints.

52. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
Not in this project.

53. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
I think the team is working well

54. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
So far so good

55. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No, only to the main contractors, again this is a small project not that obvious

56. As designers you would like more input from contractors and sub-contractors concerning health and safety to assist you in your design. Do you agree?
In this renovation work not that relevant

57. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No.

58. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
    No, any comments from the independent safety official will be taken care of

59. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
    Yes, zero accident.

Interview: Safety Officer-Contractor

A) General - The project

1. What is your experience in handling construction projects and is this project unique or is it just another project handled by you?
   Just another small project

2. What stage is the project now, and are you satisfied with its progress relating to quality and time?
   About 60% and running smoothly

3. What about health and safety aspect, if the construction period has started, is there any incident to be reported?
   No accident, but report on scaffoldings not installed properly

4. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   Not really

5. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   We the contractor need to follow the client's instructions and our company has a good safety record

6. Is there any benchmark for the project in term of health and safety?
   Our target is always zero incident

7. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Both, but clear drawings and specifications form designers, client helps.

8. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes, we have qualified safety officers and I am one of them, in-charge of safety

9. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Not to this project but the overall safety training to be able to be a qualified safety officer

10. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
    To get the public cooperation-some houses are occupied

11. Are you satisfied with your knowledge regarding the health and safety legislation, especially the implementation of CDM?
    Yes

12. Do you think doing this project's safety will affect quality and productivity?
    Yes, any mishaps will affect progress

B) The role of the client relating to health and safety (Proposition 1).

13. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    We deal direct with the designer who works on behalf on the client-I think, the client let the designer to deal with safety-they have no or little contribution

14. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    The designer, to us is the client, in this case they are very experienced

15. Who is in charge of ensuring that the project complies with the health and safety regulations?
    On our part we have safety officer and the client has an independent safety official

16. At which stage of the production process does the client give strong concern about health and safety?
    Safety plan before work starts

17. Is there any a meeting or discussions initiated by the client regarding health and safety?
    No, we just need the approval to start work after submitting safety plan

18. Does the client rely entirely on the Planning Supervisor to advice him about health and safety?
    Yes.

19. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    This is a small job-not really relevant

20. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Client just to complete the job on time without any incident

C) Procurement as a driver for health and safety (Proposition 2).

21. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
We are not involved

22. Does your organisation have any safety record/policy that might help the client in assessing your health and safety record regarding the design of projects?
Yes, our safety record has to be positive in order to register with **the council**

23. In the selection criteria of the main contractor, how significant is their safety record?
Only listed company allowed to bid for the project

24. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
Not sure

25. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
Submission of safety plan – client can scrutinise the plan before approval

26. Do you think more money should be allocated to care for health and safety in this project?
Not really

27. Do the drawings and specifications have clear instruction regarding health and safety?
Yes

28. How would you define good /best practise as used in health and safety management?
Both parties, client and contractor have same target-zero incident

29. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
Our safety plan should be accepted

30. Do you refer to the UK government procurement guidance in achieving value for money (vfm) in this project?
Not really

31. Are you **satisfied** that the procurement process of this project has taken account health and safety?
Yes

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Not sure

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Yes, complete design helps contractor to be well prepared

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method		x			
Selection of contractor		x			
Selector of designers		x			
Pre-qualification (if any)		x			
Drawings and specifications		x			

35. Do you think procurement is a better driver than legislation in improving health and safety?
Legislation

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes.

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
We have a clear safety contract regarding safety

D) Team Integration in promoting health and safety (Proposition 3)

38. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

39. Are you satisfied the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
The architect, on behalf of the council gives adequate instructions

40. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

41. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Detail design stage

42. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes.

43. Does the Planning Supervisor request for feed- back or information from other team members in order to prepare the safety file?
Not from the client's side

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Don't know we are not involved

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraints.

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
No

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
Not so sure

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
No

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
They only deal with us

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No.

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
No, hopefully none

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
Yes, zero accident.

Respondent: Architect

Structured Questionnaires to key-players in the renovation project
The questions are designed differently for different correspondent based on their job and relevance in the safety issue.
Please rate the respond that best describes your opinion on the following:

1. The health and safety policy of the client is well documented and your team of designers fully understood the importance of considering health and safety in all their designs including the design of this project.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

2. The preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they formed a good basis for the contractor to price the job without compromising on the health and safety.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

3. 3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
Rating: 1. Disagree 2. Agree a little 3. Agree 4. Strongly agree
Further comment: *Unsure*
Our clients are not technically aware. They see H &S as the Design team or Contractor's responsibility

4. The safety record of the contractors submitted during the tendering process has little impact on the selection result because only contractors listed with the Council were called to tender and the have approved health and safety record.
Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
Further comment:
However where we use non-listed contractors their H&S record is closely scrutinised

5. The traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stage of design and give some input in relation to health and safety of the project.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

6. If the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

7. Team integration is vital for better design product and the 'in-house' facility for all the consultants in your organisation makes it easier to achieve the client's objectives.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

8. As the client's agent and the leader of the production team how much influence do you have on the overall health and safety of the project?
   Rating: 1. Nil 2. Little Significant 3. Significant **4. Very Significant**
   Further comment:
   As designers we have obligations under the Law, it should be very strong influence

9. Health and safety have significant impact on the overall cost of the project.
   Rating: 1. Nil **2. Little Significant** 3. Significant 4. Very Significant

10. What is your rating of the integration of the team in this project-particularly when using the procurement strategy you have adopted?
    Rating: 1-10: 5

11. Rate the following according to their influence regarding health and safety in this project:
    Rating: 1-10

Personal	Rating
The client's agent	10 (6)*
The contract's manager	10
The Planning Supervisor	10
HSE health and safety inspector	10
Designers	8
The client	2

** Comment: for the client's agent- where the designer is not the designer the score is 6*

Respondent: Architect, City of Salford Council

Please rate the respond that best describes your opinion on the following:

1. The health and safety policy of the client is well documented and your team of designers fully understood the importance of considering health and safety in all their designs including the design of this project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

2. The preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they formed a good basis for the contractor to price the job without compromising on the health and safety.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
   Rating: **1. Disagree** 2. Agree a little 3. Agree 4. Strongly agree

Further comment:
Client has no involvement

4. The safety record of the contractors submitted during the tendering process has little impact on the selection result because only contractors listed with the Council were called to tender and the have approved health and safety record.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Further comment:
   However where we use non-listed contractors their H&S record is closely scrutinised

5. The traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stage of design and give some input in relation to health and safety of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

6. If the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree

7. Team integration is vital for better design product and the 'in-house' facility for all the consultants in your organisation makes it easier to achieve the client's objectives.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

8. As the client's agent and the leader of the production team how much influence do you have on the overall health and safety of the project?
   Rating: 1. Nil 2. Little Significant 3. Significant **4. Very Significant**
   Further comment:
   As designers we have obligations under the Law, it should be very strong influence
9. Health and safety have significant impact on the overall cost of the project.
   Rating: 1. Nil 2. Little Significant 3. Significant **4. Very Significant**

10. What is your rating of the integration of the team in this project-particularly when using the procurement strategy you have adopted?
    Rating: 1-10: 4

11. Rate the following according to their influence regarding health and safety in this project:
    Rating: 1-10

Personal	Rating
The client's agent	10 (6)*
The contract's manager	10
The Planning Supervisor	10
HSE health and safety inspector	10
Designers	8
The client	2

Respondent: Chief Quantity Surveyor of City of Salford Council

Please rate the respond that best describes your opinion on the following:

1. The provision for health and safety in this project has significant implication on the total cost of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Further comment:
   It may involve such costing on H&S requirements as stated in the Bill. This will include the protection and scaffoldings. In addition the insurance costs will be necessary.

2. The preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they formed a good basis for the contractor to price the job without compromising on the health and safety.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**
   Further comment:
   A classical example can be seen in terms of Contractor's pricing of scaffolding. Higher level of job may evolve higher cost of scaffolding due to H&S requirements.

3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

4. The safety record of the contractors submitted during the tendering process has little impact on the selection result because only contractors listed with the Council were called to tender and the have approved health and safety record.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Further comment:
   Most of the contractors tendering for any project have been through inspection process conducted by the department

5. The traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stage of design and give some input in relation to health and safety of the project.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

6. If the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.
   Rating: **1. Disagree** 2. Agree a little 3. Agree 4. Strongly agree
   Further comment:
   Not necessary because H&S requirements have been stated clearly in the Bills. Further more, the regular inspections by safety Official does not permit them to compromise on H&S

7. Team integration is vital for better design product and the 'in-house' facility for all the consultants in your organisation makes it easier to achieve the client's objectives.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

8. If the project is done using design-build method, the contractor will have more opportunity to give input regarding health and safety earlier in the design stage and this will minimise problems during construction stage.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Further comment:
   This will depend on client's briefing on H&S requirements as well as in accordance to current regulations

9. If the contractor is involved earlier in the design stage through other procurement strategy, e.g. design- build or partnering, the team integration will be more effective.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

10. During the production process for this project, give your rating for the following activities that help in the successful implementation of health and safety for the project.**Rating: 1-10**

Activity	Rating
Client's brief / specification	10
Selection of main contractor	8
Type of procurement strategy	5
Preparation of Pre-Tender Health and Safety Plan	10
Method Statement / Health and Safety Plan- Main Contractor	10
Selection of sub-contractors and suppliers	8
Input by client during construction	5
Daily/weekly health and safety report	10
Inspection by HSE	10

Respondent: Safety Official

Please rate the respond that best describes your opinion on the following:

1. The Pre-Tender Health and Safety Plan provided by the client has sufficient information for you to prepare for the Post Contract Health and Safety Plan.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Further comment:
   Shortage of information is usually in the form of lack of drawings for services, i.e. gas, electricity and water.

2. Your company's record has significant influence on the success of getting this project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

3. All sub-contractors and suppliers are given adequate instructions or information regarding your company's H&S policy to ensure they understand your company's stand regarding H&S.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Further comment:
   See enclosure marked 93, this sent with sub-contractors letter.

4. If the project is done using design-build method, the contractor will have more opportunity to give input regarding health and safety earlier in the design stage and this will minimise problems during construction stage.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

5. The client's H&S policy in this project in this project had significant impact on the overall success in term of H&S of the project.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

6. Health and safety have significant impact on the overall cost of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

7. In the open tender process the contractor is in dilemma to allocate more money for H&S because this might jeopardise the chance of winning the tender.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree

8. What is the rating of the client's influence in the implementation of health and safety at the design stage of the project?
   Rating: 1-10: 10

9. What about construction stage?
   Rating: 1-10: 8

10. In ensuring that the workers on site are following all the H&S regulations, the involvement of the client on site is important, and their regular site visits, communication with workers will give great impact on their safety behaviour.
    Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
    Further comment:
    I feel this is useful if concerns are given to the contractor and he makes appropriate action as he is responsible for H&S at this stage. Very often client still believes he is not directly responsible which can cause friction.

11. It is still difficult to ensure every worker on site follow all the safety regulations especially regarding to the wearing of safety hat and boots all the time despite their knowledge about the regulations.
    Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

Respondent: Independent Safety Officer

Please rate the respond that best describes your opinion on the following:

1. The preparation of the Pre-Tender Health and Safety Plan for this project was based on completed drawings and specifications, therefore this helps the contractor to prepare for the Health and Safety Plan for the project in detail including adequate cost consideration for health and safety.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

2. The traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stage of design and give some input in relation to health and safety of the project.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

4. The safety record of the contractor submitted during the tendering process has little impact on the selection process.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

5. The client is instrumental in leading the team to ensure every body plays their role in the implementation of health and safety during the design stage of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

6. If the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

7. The client's Health and Safety policy is well documented and all bidders for this project were given enough information to ensure that they have taken serious thought about doing the project safely.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

8. The main-contractor has strong influence on the commitment of their sub-contractors and they are given enough information and instruction regarding health and safety.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree

9. You are satisfied with the site monitoring of health and safety by the site supervisor
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree

Respondent: Planning Supervisor

Please rate the respond that best describes your opinion on the following:

1. The provision for health and safety in this project has significant implication on the total cost of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

2. The preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they formed a good basis for the contractor to price the job without compromising on the health and safety.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
   Rating: **1. Disagree** 2. Agree a little 3. Agree 4. Strongly agree

Further comment:
Client has no involvement

4. The safety record of the contractors submitted during the tendering process has little impact on the selection result because only contractors listed with the Council were called to tender and the have approved health and safety record.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

5. The traditional method of tendering for this project means that the contractor has no opportunity to be involved in the early stage of design and give some input in relation to health and safety of the project.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

6. If the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.
   Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree

7. Team integration is vital for better design product and the 'in-house' facility for all the consultants in your organisation makes it easier to achieve the client's objectives.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

8. If the project is done using design-build method, the contractor will have more opportunity to give input regarding health and safety earlier in the design stage and this will minimise problems during construction stage.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**

9. If the contractor is involved earlier in the design stage through other procurement strategy, e.g. design- build or partnering, the team integration will be more effective.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

10. During the production process for this project, give your rating for the following activities that help in the successful implementation of health and safety for the project.
    Rating: 1-10

Activity	Rating
Client's brief / specification	2
Selection of main contractor	4
Type of procurement strategy	4
Preparation of Pre-Tender Health and Safety Plan	4
Method Statement / Health and Safety Plan- Main Contractor	9
Selection of sub-contractors and suppliers	9
Input by client during construction	7
Daily/weekly health and safety report	8
Inspection by HSE	9

APPENDIX E: CASE STUDY 3

The project: The Mosque, Precinct 3, Putra Jaya

This is a prestigious project involving the construction of a mosque with the capacity of 20,000 worshipers in a new township. This township is designed to cater for all government offices and residential area near the capital of Malaysia, Kuala Lumpur. This project also includes the landscaping job or known as the 'Kiblat Walk'. The employer is the town council of the new township. The council appointed a Project Manager to act as the client's agent to run the project.

The cost of the project is in the region of RM 230 million or about 30 million pounds. The duration is 22 months. At the time of this study, the project is just started and the progress is about 6%. This is a traditional type of contract whereby contractors are invited to participate in an open system based on completed bills of quantities prepared by the consultant quantity surveyor. There is also a pre-qualification exercise to selected only qualified contractors to bid for the job.

It is interesting to note that the town council for this project provides its own form of contract with the title of 'P.P. J FORM 2000'. This is quite unique in Malaysia because normally the usual forms of contract used are those issued by the Public Works Department for government jobs, the PAM form of contract issued by the Board of Architects or the most recent the CIDB form of contract.

Respondent: Main Contractor

A) General - The Project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   Yes
2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   Yes
3. Is there any benchmark for the project in term of health and safety?
   Yes
4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Contractor
5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes
6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Yes

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   Awareness of all parties- I mean not all parties is really concern
8. Are you satisfied with your knowledge regarding the health and safety
   Yes
9. Do you think doing this project safely will affect quality and productivity?
   No

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with the client's input regarding health and safety in order to help you with the design of this project?
    Yes
11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Awareness and implementation
12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    Yes
13. Are you satisfied with the role as the client in ensuring all members of the team play their part concerning health and safety?
    Yes
14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    Project Manager
15. At which stage of the production process does the client give strong concern about health and safety?
    Start to completion
16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Yes
17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Yes to attend every site meeting and briefing
18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Yes

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    Yes

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Yes

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    PM and safety officer

22. Does your organisation have a clearly defined policy concerning health and safety?
    Yes

23. Does your organisation have any safety record/policy that might help the client in assessing your health and safety record regarding the design of projects?
    Yes

24. In the selection criteria of the main contractor, how significant is their safety record?
    Very significant

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Yes

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
    (No answer)

27. Do you think more money should be allocated to care for health and safety in this project?
    Yes

28. Do the drawings and specifications have clear instruction regarding health and safety?
    Not that complete

29. How would you define good /best practise as used in health and safety management?
    Awareness and implementation

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
    Contractor's background and HSSE record

31. Are you satisfied that the procurement process of this project has taken account health and safety?
    Yes

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
    Site operation

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
    Yes

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method		X			
Selection of contractor	X				
Selector of designers	X				
Pre-qualification (if any)		X			
Drawings and specifications		X			

35. Do you think procurement is a better driver than legislation in improving health and safety?
No

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Get them involve with all HSE activities with main contractor

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
Yes

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
    Design stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
    Yes

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
    Yes

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
    Awareness and practical awareness

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
    Yes

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
    Yes

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
    Continuous awareness program and audit

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
    Yes

50. As main contractor would you like more input from suppliers and sub-contractors concerning health and safety to assist you in your construction?
    Yes

51. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
    No

52. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
    No

53. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
    Yes

Respondent: Project Management Consultant

A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   Not really.

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   Yes, the client Putra Jaya has a specific safety policy and we have the experience in doing big projects.

3. Is there any benchmark for the project in term of health and safety?
   Our target is of course zero incident.

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   All, the contractor has the experience and so more responsibility on them.

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Not specifically our staff but the contractor must have a qualified safety officer.

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   No constraints, we are confident the contractor will do the job safely.

8. Are you satisfied with your knowledge regarding the health and safety
   Yes, we know about the requirements relating to safety.

9. Do you think doing this project safely will affect quality and productivity?
   No.

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    Yes, we make sure all parties know their responsibility

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    No constraints if the client chooses the right team

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    They depend on the consultants to deliver the goods.

13. Are you satisfied with the role as the client's agent in ensuring all members of the team play their part concerning health and safety?
    Yes

14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    Safety officers both the client's and the contractor's.

15. At which stage of the production process does the client give strong concern about health and safety?
    Construction stage-any incident will be reported to the client

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    During site meetings-the client's representative is there.

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    In this case no.

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Yes

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    Yes

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Yes in term of structural safety I am confident with the consultants but specifically about site safety, not really.

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    The client-not specifically, but we look into the contractor's safety record

22. Does your organisation have a clearly defined policy concerning health and safety?
    Yes

23. Do you organisation has any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
    Not relevant-we are the project manager, not the contractor

24. In the selection criteria of the main contractor, how significant is their safety record?
    It is a criteria but in this case we know the contractor has a good safety record.

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Maybe

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
    Before possession of site need to ensure the contractor is ready to do the work safely

27. Do you think more money should be allocated to care for health and safety in this project?
    Not necessary

28. Do the drawings and specifications have clear instruction regarding health and safety?
    Yes

29. How would you define good /best practise as used in health and safety management?
    Very close supervision during construction

30. Are you satisfied that the procurement process of this project has taken account health and safety?
    Yes

31. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
    Not sure

32. In implementing best practise regarding health and safety in the procurement strategy f or this project, what are your references?
    Choosing the best contractor

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
    Yes

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method		x			
Selection of contractor		x			
Selector of designers		x			
Pre-qualification (if any)		x			
Drawings and specifications		x			

35. Do you think procurement is a better driver than legislation in improving health and safety?
    Both are crucial

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
The main contractor must realize his responsibilities and make sure the sub-cons and suppliers do the same

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
No

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. As the team leader are you satisfied that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Design and construction stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes,

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Not about site safety but safety as a whole

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraint

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
No but maybe to the main-contractor

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
No problem

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
    So far they work well

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
    No, only the main contractor

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
    No

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
    So far no

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
    We would like zero incident

Respondent: Quantity Surveyor

A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   No

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   Yes

3. Is there any benchmark for the project in term of health and safety?
   Yes set by the client

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Contractor

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   No

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   Not directly involved with construction on site

8. Are you satisfied with your knowledge regarding the health and safety
   Not really

9. Do you think doing this project safely will affect quality and productivity?
   No

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    No input

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Financial and time

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    No, client depends on project manager

13. Are you satisfied with the role of the client in ensuring all members of the team play their part concerning health and safety?
    No

14. Who is in charge of ensuring that the project complies with the health and safety regulations?

    The safety department of the town council

15. At which stage of the production process does the client give strong concern about health and safety?
    During construction especially high structures

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    No, only when they observe any bad working method

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Make some allocation for safety in the contract documents-provisional sum

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    No

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    No

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    I am not sure but they can contribute only they have experience of the method of construction

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    The client and yes, they specify about site safety

22. Does your organisation have a clearly defined policy concerning health and safety?
    No, we are QS consultant

23. Does your organisation have any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
    No

24. In the selection criteria of the main contractor, how significant is their safety record?
    Not that significant but being a good contractor they have good record

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Yes

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
    Not in this project (traditional) design-build maybe

27. Do you think more money should be allocated to care for health and safety in this project?
    Yes

28. Do the drawings and specifications have clear instruction regarding health and safety?
    No

29. How would you define good /best practise as used in health and safety management?
    Minimising risk specifically

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
    General knowledge and common sense

31. Are you satisfied that the procurement process of this project has taken account health and safety?
    Reasonably yes

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
    Architect can play better role by designing with construction safety in mind

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
    Yes

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method	X				
Selection of contractor		X			
Selector of designers	X				
Pre-qualification (if any)	X				
Drawings and specifications	X				

35. Do you think procurement is a better driver than legislation in improving health and safety?
No

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Very much so

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Impose penalty

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
Not sure

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
No

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Design stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Not really-but the contractor is very experience

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
No

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
The design is too ambitious and the contractor has to bear the risk

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
Yes-but not during design stage

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
Not really-better in design-build or negotiated tender

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
In negotiated project there is opportunity to consider cost of safety and main contractor can convince the client about safety cost

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
Yes, launching of steel structures at great height

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
Yes zero accident

Respondent: Project Manager (Contractor)

A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   No

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   Yes

3. Is there any benchmark for the project in term of health and safety?
   Yes

4. 4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Both

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   No

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   No

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   No answer

8. Are you satisfied with your knowledge regarding the health and safety
   Yes

9. Do you think doing this project safely will affect quality and productivity?
   No

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    Yes

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    No answer

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    Yes

13. Are you satisfied with the role of the client in ensuring all members of the team play their part concerning health and safety?
    Yes

14. Who is in charge of ensuring that the project complies with the health and safety Regulation?

    Project manager and safety office of the client

15. At which stage of the production process does the client give strong concern about health and safety?
    Structural works

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Yes

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Yes

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Yes

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    No

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    No

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    The client, not sure

22. Does your organisation have a clearly defined policy concerning health and safety?
    Yes

23. Does your organisation have any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
    Yes

24. In the selection criteria of the main contractor, how significant is their safety record?
    Significant

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Yes

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
    Have allocation provided

27. Do you think more money should be allocated to care for health and safety in this project?
    Yes

28. Do the drawings and specifications have clear instruction regarding health and safety?
    No

29. How would you define good /best practise as used in health and safety management?
    All stages of construction must be monitored regarding safety

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
    OHSAS 18001, ISO 9101

31. Are you satisfied that the procurement process of this project has taken account health and safety?
    Not really

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
    Allocation and clear scope of work regarding safety

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
    No

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method			X		
Selection of contractor	X				
Selector of designers		X			
Pre-qualification (if any)		X			
Drawings and specifications			X		

35. Do you think procurement is a better driver than legislation in improving health and safety?
    Yes

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
    Yes

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
    Keep train, inform and enforce

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
    Yes

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
    Not really

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
    No

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
    Yes

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
    Design stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
    Yes

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
    Yes

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
    Interfacing/coordinating

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
    Yes

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
    Yes

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
    All parties must be briefed and informed about the significant of safety at all stages
49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
    No
50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
    Yes
51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
    Yes
52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
    Yes zero accident-man-hours without accident record

Respondent: Contractor's Safety Official

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
    Yes, the need to buy items relating to safety during construction
2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
    Yes-client, contractor
3. Is there any benchmark for the project in term of health and safety?
    Yes
4. 4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
    Everybody, but at site the contractor
5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
    Yes
6. Do you have special training, courses that help you to contribute towards health and safety in this project?
    No
7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
    Budget
8. Are you satisfied with your knowledge regarding the health and safety
    Yes
9. Do you think doing this project safely will affect quality and productivity?
    No

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    Not relevant

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Budget

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    The project manager for the client, yes

13. Are you satisfied with the role of the client in ensuring all members of the team play their part concerning health and safety?
    Not really

14. Who is in charge of ensuring that the project complies with the health and safety regulations?

    The project manager and safety committee

15. At which stage of the production process does the client give strong concern about health and safety?
    All the way

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Yes every month

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Yes, maybe bonus scheme

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Maybe

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    Not sure

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Not sure

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    No idea

22. Does your organisation have a clearly defined policy concerning health and safety?
    Yes

23. Does your organisation have any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
Not relevant

24. In the selection criteria of the main contractor, how significant is their safety record?
I think so

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
Yes

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
Not in this project (traditional) design-build maybe

27. Do you think more money should be allocated to care for health and safety in this project?
Yes, a must

28. Do the drawings and specifications have clear instruction regarding health and safety?
No but we the contractor has to prepare method statement before starts work

29. How would you define good /best practise as used in health and safety management?
Minimising risk specifically

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
Not relevant

31. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
More money

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Yes

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method		X			
Selection of contractor	X				
Selector of designers			X		
Pre-	X				

qualification (if any)					
Drawings and specifications	X				

35. Do you think procurement is a better driver than legislation in improving health and safety?
No

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes for maximum safety

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Regular discussion and compulsory method statement

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
Not sure

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Design stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
I think the contractor contributes the most

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Yes

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
Site experience-only contractor is well experienced

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
No, not at design stage

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
Not sure

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
Client should allocate more money to contractor to apply maximum safety

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No, only to contractor

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
Not on team but directly to site budget

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
Yes

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
Yes zero accident

APPENDIX F: CASE STUDY 4

Proposed District Polis Head Quarters

This project consists of the construction of administrative block, workshop, hall, staff-houses, a mosque, and a store. The contract cost is 39 million Malaysian Ringgit. Duration is 24 months. Procurement strategy: direct negotiation and using design and build concept. The type of form of contract used is the Design & Build and Turnkey Contract (PWD FORM DB/T).

Respondent: Main Contractor
A) General - The Project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   This is a medium size project-so far no problem with budget or time

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   Not really, we just follow what is required by the contract-and we deal direct with the client' agent

3. Is there any benchmark for the project in term of health and safety?
   Yes, zero accident

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   Design team can be helpful-but in most cases the contractors have to bear all responsibilities

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   We deals with oil-industry job a lot and we are use to the high standard set – we think we are better than other contractors in term of safety

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Yes, some of our official and workers have basic safety trainings (Green Card)

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   To deal with foreign workers- their attitude

8. Are you satisfied with your knowledge regarding the health and safety
   Yes.

9. Do you think doing this project safely will affect quality and productivity?
   Yes, workers with discipline will give good results-but might effect time a little

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with the client's input regarding health and safety in order to help you with the design of this project?
    In this case, we deal with the Project manager direct who is the client's agent. In terms of safety, not much, all parties assume safety design means the building will not collapse-but not how to built the building safety-we have to do that ourselves.

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Client just wants the building to complete on time and within cost-safety, I don't think they are knowledgeable about site safety

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    No, once they choose consultants, they leave everything to them

13. Are you satisfied with the role as the client in ensuring all members of the team play their part concerning health and safety?
    No mention about safety at all, although they expect us to do the job safely, the client has no role to encourage us to ensure safety

14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    The project manager-client's agent

15. At which stage of the production process does the client give strong concern about health and safety?
    In construction stage, where there is site meetings and safety record presented

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Only at site meetings, chaired by client's representative.

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Not sure how they can contribute-but if some money allocated for safety, then maybe some improvement can be made

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Not really

C) Procurement as a driver for health and safety (Proposition 2*)*.

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
Not specifically to site safety, designers themselves concerned only about the structure failure

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
No – only at construction stage, we have to ensure no incident

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
It is the client's decision-the project manager is then appointed by the client. I don't think they take safety into consideration

22. Does your organisation have a clearly defined policy concerning health and safety?
Yes, this is because we used to work with oil industry

23. Do you organisation has any safety record/policy that might help the client in assessing your health and safety record regarding the design of projects?
***We do keep record of past projects-but whether it helps in this project, I am not* sure**

24. In the selection criteria of the main contractor, how significant is their safety record?
Not at all-this is negotiated project and no mention of safety records by client

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
We implement 'stick and carrot' policy to our workers-yes, if the client do the same it can be interesting

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
In the first stage if only the client can allocate more money for site safety then it helps us financially although not significantly.

27. Do you think more money should be allocated to care for health and safety in this project?
We can do it without extra money, but more money will be an incentive to do better.

28. Do the drawings and specifications have clear instruction regarding health and safety?
In the specification and bills of quantities, not in the drawings

29. How would you define good /best practise as used in health and safety management?
To have clear instructions and regulations to all site supervisors to help them day to day safety checking and implementation

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
    Everybody should at least discuss about safety at the design stage-not in this case
31. Are you satisfied that the procurement process of this project has taken account health and safety?
    No, not at all
32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
    Everything is going fine, no suggestion

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
    Yes, difficult design will have higher risk
34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method			x		
Selection of contractor		x			
Selector of designers				x	
Pre-qualification (if any)		x			
Drawings and specifications		x			

35. Do you think procurement is a better driver than legislation in improving health and safety?
    Legislation, law and enforcement is better
36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
    This will be good news to contractors-yes, very helpful

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
    Main contractor must be really concern about safety and they can design their contract with them and include safety

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
No, not till today

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Not so much of safety but time and budget

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
At the construction stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
No, not all concern about site safety-structural safety yes.

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Can't remember of any

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
Knowledge and lack of concern

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
No

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
Yes, we worked together from the very start

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
Team work is ok, but the issue of safety is not necessary the main agenda

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No, they deal direct with us, the main contractor

50. As main contractor would you like more input from suppliers and sub-contractors concerning health and safety to assist you in your construction?
Can't see how they can contribute-but as long as they work with us they have to follow all site regulations

51. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?

No.

52. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
No, only small incidents and not serious

53. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
We target no fatalities-injuries to be real, unavoidable but we try our best

Respondent: Project Management Consultant.
A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
This is a negotiated project and we make sure the contractor has taken care of safety in the cost as agreed-this also include time

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
The client, the Ministry concerned has appointed us as the agent and also the contractor who has his own team of consultants- there is no specific instructions but it is obvious that we have to do the work safely.

3. Is there any benchmark for the project in term of health and safety?
Not a stated benchmark but hope zero incident

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
Both designers to ensure structural safety and contractor construction safety

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   We follow the safety regulations stipulated by the authorities like DOSH and CIDB

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   No, but only Green Card safety training is a must for everyone

7. Are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   No constraints-we expect the contractor to do the job safely

8. Are you satisfied with your knowledge regarding the health and safety
   I think so

9. Do you think doing this project safely will affect quality and productivity?
   Yes any mishap will result in stoppage of work-quality not sure

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    The selected consultants will do their job, we just coordinate their work- input from us directly, no.

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Knowledge about how to do the work safely normally with contractor due to their site experience-client's not so knowledgeable.

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    No

13. Are you satisfied with the role as the client's agent in ensuring all members of the team play their part concerning health and safety?

    Yes we expect all parties to play their part

14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    As the project proceeds, we will make sure everything to run smoothly with no incident-ensure that contractor follow all regulations.

15. At which stage of the production process does the client give strong concern about health and safety?
    During construction

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Not by the client, but the consultants during site meetings

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    As client's agent we can suggest to all consultants and contractor to be more particular about safety

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Yes, casualties or injuries will result in late completion but direct relationship to quality not that obvious

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    The brief concerns about space and functions-not specifically on safely

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Yes, I am confident they have looked into it

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    The Ministry concerned decided on negotiated tender-no, I don't think they specifically consider safety

22. Does your organisation have a clearly defined policy concerning health and safety?
    Not specifically on safety

23. Do you organisation has any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
    No

24. In the selection criteria of the main contractor, how significant is their safety record?
    The contractor has been chosen directly by the client-all contractors are registered with CIDB and their safety record might has been scrutinised

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Has not done it before, but might be a good idea to reward contractors with good safety record

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
Final agreement stage where the regulations of safety should be highlighted in the contract

27. Do you think more money should be allocated to care for health and safety in this project?
I think it is enough

28. Do the drawings and specifications have clear instruction regarding health and safety?
Specifications and in the bills has clear instructions

29. How would you define good /best practise as used in health and safety management?
Before work starts all regulations regarding safety should be verified by safety officials

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
The contract, specifications

31. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes, all particulars regarding safety is in the contract documents .

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Not sure

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Yes, depends on what type of design, high rise will be more risky to build

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method			x		
Selection of contractor		x			
Selector of designers			x		
Pre-qualification (if any)		x			
Drawings and specifications		x			

35. Do you think procurement is a better driver than legislation in improving health and safety?
I think legislation and enforcement is better

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes, a reasonable provisional sum will help the contractors

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Main contractor should play important role like insisting clear instructions

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
No, bit if any, it depends on what type of changes

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
So far so good

40. As the team leader are you satisfied that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes – in ensuring that the contract includes safety issue

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Construction stage

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes, they are well experienced

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
I am sure the consultants have considered them

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraints

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
The main-contractor chooses the consultants and in this design-build I don't think the sub-contractors are involved

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
We have good teamwork form the beginning

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
No suggestion

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No, only with main contractor

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No.

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
No

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
Impliedly agreed there should be no or minimum incidents

Respondent: Quantity Surveyor

A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
Not sure, maybe

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
Yes, for a project value of more than 20 million, it is a requirement to provide safety officer and safety team

3. Is there any benchmark for the project in term of health and safety?
Not sure

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?

   The major responsibility is the main contractor. Design team can act as a regulator

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Not sure

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   N o, only basic knowledge while training at CIDB for Green Card purposes

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   No constraints but the PMC should play more roles regarding health and safety-we are only the QS

8. Are you satisfied with your knowledge regarding the health and safety
   No

9. Do you think doing this project safely will affect quality and productivity?
   Yes, safe environment will contribute to better productivity

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    Not sure

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Client is more particular about cost and time, safety contractor's part – should allocate provisional budget for safety in the tender

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    Not sure

13. Are you satisfied with the role of the client in ensuring all members of the team play their part concerning health and safety?
    No, no clear instruction – construction board should play major role to enforce and regulate

14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    For this project (design-build contract) PMC should fully in charge and regulate

15. At which stage of the production process does the client give strong concern about health and safety?
    At site meetings
16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Not sure
17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Yes by introducing independent safety officer

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Only the consultants but they don't border

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    Not specifically about safety

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    No, only us the QS we use standard form of contract which implements health and safety issue

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    The client-not about safety, just cost and time

22. Does your organisation have a clearly defined policy concerning health and safety?
    No
23. Do you organisation has any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
    Not sure

24. In the selection criteria of the main contractor, how significant is their safety record?
    Not included in the selection criteria
25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Yes, why not

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
    Method statements from the contractor must be approved prior to construction. Selection of plants and machinery also important

27. Do you think more money should be allocated to care for health and safety in this project?
Yes, as previously said provisional sum should be allocated in the beginning, some form of budget which should be enough for the project

28. Do the drawings and specifications have clear instruction regarding health and safety?
Not sure

29. How would you define good /best practise as used in health and safety management?
Everybody should work together form the beginning about safety

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
Standard form of contract, books, papers from seminars

31. Are you satisfied that the procurement process of this project has taken account health and safety?
No

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Looking into the contractors record-if any

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Yes, the site conditions can determine the difficulty in construction, easy design but hazardous to construct

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method			x		
Selection of contractor			x		
Selector of designers			x		
Pre-qualification (if any)			x		
Drawings and specifications				x	

35. Do you think procurement is a better driver than legislation in improving health and safety?
Not sure

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Main contractor should specify this in their contract with sub-contractors

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
No

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Not sure

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes – the client's agent not the client

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Not sure, maybe

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Construction stage-post contract

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Not really

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No regulators, not mandatory

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
    No, never being asked

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
    Not sure

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
    No suggestion

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
    No

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
    Not sure

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
    Yes, minor accident and some injuries but not that serious

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
    No, it seems that the element of safety was not a major concern

Respondent: the Architect.

A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   No, time a bit tight but it will not affect safety

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   No, but it is understood that the work must be done safely

3. Is there any benchmark for the project in term of health and safety?
   No bench mark but hopefully no incidents

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   We designers have to make sure our design is safe and the contractor will build it safely

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes we have done many projects before – even bigger projects

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Not really- but we have to know all the existing law and regulations

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   No constraints

8. Are you satisfied with your knowledge regarding the health and safety
   Yes

9. Do you think doing this project safely will affect quality and productivity?
   Yes

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    Yes

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Their knowledge about site safety

12. .Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    No

13. Are you satisfied with the role of the client in ensuring all members of the team play their part concerning health and safety?
    The client's agent-not the real client

14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    All parties

15. At which stage of the production process does the client give strong concern about health and safety?
    During construction period

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Yes site meetings

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
Show more concern form the beginning-how not sure

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
Not sure

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
The brief is about space and function, side conditions etc. but not specifically on safety, about safety of structure, the engineer's responsibility

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
Structural safety is clear but site safety normally the contractor will take care of that

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
This is the client's decision; I don't think site safety is considered

22. Does your organisation have a clearly defined policy concerning health and safety?
No

23. Do you organisation has any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
No

24. In the selection criteria of the main contractor, how significant is their safety record?
The client choose the contractor directly, I am sure safety record is relevant

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
Maybe

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
The contract document has enough coverage regarding safety

27. Do you think more money should be allocated to care for health and safety in this project?
Not necessarily

28. Do the drawings and specifications have clear instruction regarding health and safety?
The contract document which includes specification and bills is enough

29. How would you define good /best practise as used in health and safety management?
The contractor should have proper safety policy

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
Refer to the contract

31. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Ask contractor to provide method statement before construction

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Safe design is a must

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method			x		
Selection of contractor		x			
Selector of designers			x		
Pre-qualification (if any)		x			
Drawings and specifications		x			

35. Do you think procurement is a better driver than legislation in improving health and safety?
Law and legislation better

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Main contractor must be strict with them regarding safety

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
No

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Construction stage all parties must ensure contractor done his job relating to safety

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes- all are very experience

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Not site safety issue

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraints

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
No

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
No problem in this job

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
    No suggestion

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
    No

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
    No.

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
    No

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
    No incident

Respondent: The Structural and Civil Engineer

A) General - The project

1. Do you have budget and/or time constraints to complete this project that might jeopardise health and safety?
   No, time a bit tight but it will not affect safety

2. Is there any specific instruction from higher authority to ensure that the project should be built safely?
   No, but it is understood that the work must be done safely

3. Is there any benchmark for the project in term of health and safety?
   No bench mark but hopefully no incidents

4. In your opinion, who is responsible for health and safety in this project, is it the contractor or the design team?
   We designers have to make sure our design is safe and the contractor will build it safely

5. Are you satisfied with your knowledge to give significant contribution regarding health and safety in this project?
   Yes we have done many projects before – even bigger projects

6. Do you have special training, courses that help you to contribute towards health and safety in this project?
   Not really- but we have to know all the existing law and regulations

7. What are the constraints that prevent you from giving maximum input regarding health and safety in this project?
   No constraints

8. Are you satisfied with your knowledge regarding the health and safety
   Yes

9. Do you think doing this project safely will affect quality and productivity?
   Yes

B) The role of the client relating to health and safety (Proposition 1).

10. Are you satisfied with your input regarding health and safety in order to help with the design of this project?
    Yes

11. What are the constraints do you think the client have to be able to give maximum input to the design team to ensure they consider health and safety seriously in this project?
    Their knowledge about site safety

12. Do you think the client has adequate knowledge regarding health and safety in order to give significant input for the designers?
    No

13. Are you satisfied with the role of the client in ensuring all members of the team play their part concerning health and safety?
    The client's agent-not the real client

14. Who is in charge of ensuring that the project complies with the health and safety regulations?
    All parties

15. At which stage of the production process does the client give strong concern about health and safety?
    During construction period

16. Is there any a meeting or discussions initiated by the client regarding health and safety?
    Yes site meetings

17. Would you like the client play more effective and significant role regarding health and safety and if please give any suggestion?
    Show more concern form the beginning-how not sure

18. Do you believe that the client understand the relationship between health and safety and quality of this project?
    Not sure

C) Procurement as a driver for health and safety (Proposition 2).

19. During the project brief, are you satisfied that enough information is given regarding health and safety to the designers to assist them in their design?
    The brief is about space and function, side conditions etc. but not specifically on safety, about safety of structure, the engineer's responsibility

20. Do you think that during the design stages, all members of the design team have given serious thought concerning health and safety?
    Structural safety is clear but site safety normally the contractor will take care of that

21. Who advises the selection of procurement method in this project and does it take health and safety consideration in doing so?
    This is the client's decision, I don't think site safety is considered

22. Does your organisation have a clearly defined policy concerning health and safety?
    No

23. Do you organisation has any safety record/policy that might help the client in assessing the contractor's health and safety record regarding the design of projects?
    No

24. In the selection criteria of the main contractor, how significant is their safety record?
    The client choose the contractor directly, I am sure safety record is relevant

25. Do you belief in incentive scheme to promote health and safety, and is it possible to implement in this project?
    Maybe

26. In the type of procurement chosen for this contract, which area do you thing can be improved to enhance health and safety?
    The contract document has enough coverage regarding safety

27. Do you think more money should be allocated to care for health and safety in this project?
    Not necessarily

28. Do the drawings and specifications have clear instruction regarding health and safety?
    The contract document which includes specification and bills is enough

29. How would you define good /best practise as used in health and safety management?
    The contractor should have proper safety policy

30. In implementing best practise regarding health and safety in the procurement strategy for this project, what are your references?
    Refer to the contract

31. Are you satisfied that the procurement process of this project has taken account health and safety?
Yes

32. If you are given another chance to do this project again which area in the production process will you focus to give more consideration to health and safety?
Ask contractor to provide method statement before construction

33. Do you think that the design stage is crucial in determining safety on the construction site for this project?
Safe design is a must

34. During the procurement process, what is their contribution concerning health and safety in this project?

	Very significant	Significant	Little significant	Not significant	Not sure
Choice of procurement method			x		
Selection of contractor		x			
Selector of designers			x		
Pre-qualification (if any)		x			
Drawings and specifications		x			

35. Do you think procurement is a better driver than legislation in improving health and safety?
Law and legislation better

36. If a provisional sum is allocated for health and safety, do you think this will help the contractors in pricing the job without jeopardising their chance of winning the contract?
Yes

37. What is your suggestion to ensure that the sub-contractors and suppliers do have the same concern regarding health and safety?
Main contractor must be strict with them regarding safety

38. If there are any changes in design or specification of this project, the issue of health and safety being considered?
No

D) Team Integration in promoting health and safety (Proposition 3)

39. Are you satisfied that the whole team members have the same objectives/targets for this project?
Yes

40. Are you satisfied with the client, as the team leader that clear instruction, information has been given to ensure all team members have the adequate concern regarding health and safety in this project?
Yes

41. Do all the team members assist each other in the implementation of health and safety legislation, regulations throughout the production process?
Yes.

42. In which stage of the project do you think that the input of all design team is crucial in ensuring the design is safe?
Construction stage all parties must ensure contractor done his job relating to safety

43. Are you satisfied with the team knowledge regarding health and safety in order to give maximum contribution to the project?
Yes- all are very experience

44. Is there any meeting, discussions in the early stages of the production process among team members regarding health and safety?
Not site safety issue

45. What are the constraints that prevent team integration in order to provide satisfactory health and safety management throughout the project?
No constraints

46. Is there any input from the main contractor and sub- contractors concerning health and safety to be utilised by the design team?
No

47. Is the procurement method used in this project has any impact on the success of team integration and what type of procurement route you think will help in better team integration?
No problem in this job

48. Are there any suggestions to improve better team integration in this project in order to deliver a safer project?
No suggestion

49. Is there any venue for the sub-contractors or suppliers to have direct contact with the client in order to give input about site safety?
No

50. Do the budget and schedule of this project has any significant effect on the team integration process to be able to give better focus on health and safety?
No.

51. Is there any significant event that triggers the concern of all members concerning health and safety in this project?
No

52. Is there any benchmark or target concerning health and safety for this project that has been agreed by all team members?
No

Respondent: Architect
Structured Questionnaires for key respondents
Please rate the respond that best describes your opinion on the following:

1. The main contractor has chosen you to be his designer due to long term working relationship.
Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure
Any further comments:
We have good record with the main contractor over the years

2. The time given for submitting the first proposal during the first stage of tendering is sufficient to consider the health and safety aspects of the project.
Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure
Any further comments:
Not really, but I agree that it should have better consideration and time for safety

3. The information given by the client's agent is good enough for you to submit a good proposal with due regard to health and safety.

Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure
Any further comments:
Even the client's agent is not aware of this things

4. Who has greater influence regarding health and safety in this project, the client's agent or the main contractor?
Answer: **Client's agent /** main contractor

5. Good leadership is critical for the success of any project. Please rate using the scale of 1 to 10 the team leader in this project against the following qualities.
Scale: 1. Lowest. - 10. Highest

Qualities	Rating
Enthusiast	4
Champion of change	4
Good communicator	6
Leads by example	8
Open	6
Risk tolerant	5
Visionary	4
Motivator, failure tolerant	3
Good delegate	5

6. Rate the following personal according to their influence regarding health and safety in this project.

Personal	Rating
The client's agent	7
The contract's manager	7
The Planning Supervisor	5
HSE health and safety inspector	6
Designers	5
The client	8

7. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure

8. The client has great influence on the health and safety issues and provides significant input during the design stage.
Rating:
1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure
Any further comments:
The client is the 'king'- he should take care of everyone under him-must have strong attitude and good ethic

9. The freedom of choice of consultants by the main contractor makes it easier to work as a team in this project.
Rating: 1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree
Any further comments:
Some consultants just obey what the contractor wants-not that effective

10. The two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage.
Rating: **1. Disagree** 2. Agree a little 3. Agree 4. Strongly agree

Any further comments:
Although we are together in the beginning, consultants don't have much say-main contractor too 'powerful'

11. What is your rating for the integration of the team in this project-particularly when using the procurement strategy adopted for this project (two-stage/design-build)?
Rating: 1-10: ...4.....

12. What is your rating concerning the client in relation to their contribution, input to assist you in the overall success of the project.
Rating: 1-10: ...3.....

13. During the production process for this project, give your rating for the following activities that help in the successful implementation of health and safety for the project.
Rating: 1-10

Activity	Rating
Client' brief or client's specification	8
Selection of main contractor	8
Type of procurement strategy	7
Preparation of Pre-tender health and safety plan	7
Method statement by main contractor-health and safety plan	7
Selection of consultants by contractor	4
Selection of sub-contractors and suppliers	7
Input by client during construction	8
Daily and weekly health and safety report by site supervisor	6
Inspection by HSE	7

Respondent: Project Management Consultant
Please rate the respond that best describes your opinion on the following:

1. The health and safety policy of the client is well documented and your team of designers fully understood the importance considering health and safety in all their designs including the design for this project.
Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**
Any further comments:
But the problem is lack of 'urgency' form the client in terms of safety issue

2. The preparation of the pre-tender health and safety plan for this project was based on the detailed design and specification and they were formed a good basis for the contractor to price the job without compromising on health and safety.
Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

3. The client has an important role, influence in ensuring all parties are serious in implementing health and safety in the project.
Rating:
1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure

Any further comments:
They depends on us to ensure others follow all regulations-not directly from them

4. The safety record of the contractor submitted during the tendering process has little impact on the selection process.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Any further comments:
   Just ensure that that selected contractor consider safety during construction

5. If the selected contractor's tender price is lower than the client's estimate for this project, there is a possibility the standard of health and safety is lower than required.
   Rating: 1. Disagree 2. Agree a little 3. Agree **4. Strongly agree**
   Any further comments:
   But in this case – negotiated tendering not that serious

6. Team integration is vital for better design product and the 'in-house' facility for all the consultants in your organisation makes it easier to achieve the client's objectives.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree

7. As the client's agent and the leader of the production team how much influence do you have on the overall health and safety of the project?
   Rating: 1. Nil 2.Little Significant **3. Significant** 4. Very Significant
   Any further comments:

Respondent: Quantity Surveyor

1. The two-stage tendering/ negotiated design-build procurement method for this project is positive for team integration and provides better cooperation from all parties early in the design stage.
   Rating: 1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree
   Any further comments:
   It is a positive thing-we work together from the beginning

14. The client has great influence on the health and safety issues and provides significant input during the design stage.
    Rating:
    1. Disagree 2. Agree a little 3. Agree 4. Strongly agree 5. Unsure
    Any further comments:
    Contractor should take all risk

2. Good leadership is critical for the success of any project. Please rate using the scale of 1 to 10 the team leader in this project against the following qualities.
   Scale: 1. Lowest. - 10. Highest

Qualities	Rating
Enthusiast	6
Champion of change	5
Good communicator	8

Leads by example	7
Open	8
Risk tolerant	6
Visionary	6
Motivator, failure tolerant	8
Good delegate	8

3. Provision for health and safety has a significant financial impact on this project.
   Rating:
   1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure

4. The type of procurement chosen for this project has given the contractor a significant opportunity to give input in the early stages of the design stage in terms of health and safety.
   Rating:
   1. Disagree 2. Agree a little 3. Agree 4. Strongly agree 5. Unsure
   Any further comments:
   No specific input about safety in the early stages

5. The procurement method used in this project is better than open-tendering method because the contractor has the better opportunity to incorporate the health and safety aspect during the design stage and this allows for adequate allocation for health and safety.
   Rating:
   1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure

6. During the production process for this project, give your rating for the following activities that help in the successful implementation of health and safety for the project.
   Rating: 1-10

Activity	Rating
Client' brief or client's specification	2
Selection of main contractor	3
Type of procurement strategy	2
Preparation of Pre-tender health and safety plan	-
Method statement by main contractor-health and safety plan	-
election of consultants by contractor	2
Selection of sub-contractors and suppliers	2
Input by client during construction	1
Daily and weekly health and safety report by site supervisor	6
Inspection by HSE	6

Respondent: Safety Officer of the Contractor
Please rate the respond that best describes your opinion on the following:

1. Your company's safety record has significant influence on the success of the bidding for this project.
   Rating:
   1. Disagree 2. Agree a little 3. Agree 4. Strongly agree **5. Unsure**
   Any further comments:
   We are involved with oil industry- with high safety record- but I don't think that helps in our bidding

2. All sub-contractors and suppliers are given adequate instructions or information regarding your company's health and safety policy to ensure they understand your company's stand regarding health and safety.
   Rating:
   1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure

3. If the main contractor is involved in the early stages of design e.g. in design –build contract, then the main contractor can give more significant input in the design in respect to the health and safety.
   Rating:
   1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure
   Any further comments:
   But in this case the import is totally technical aspects not site work aspects

4. The client's health and safety policy in this project had significant impact on the overall success in term of health and safety of the project.
   Rating:
   1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure

5. The implementation of health and safety for this project has a significant impact on the overall cost of the project.
   Rating:
   1. Disagree **2. Agree a little** 3. Agree 4. Strongly agree 5. Unsure
   Any further comments:

6. In the open tender process the contractor is in dilemma to allocate more money for health and safety because this might jeopardise the chance of winning the tender.
   Rating:
   1. Disagree 2. Agree a little **3. Agree** 4. Strongly agree 5. Unsure

7. In the rating of 1 to 10, what is the rating of the client's influence in the implementation of health and safety in this project at the **design stage**?
   Rating:.....4.....

8. In the rating of 1 to 10, what is the rating of the client's influence in the implementation of health and safety in this project at the **construction stage**?
   Rating:...4.....

9. In ensuring that the site operators are following all the health and safety regulations, the involvement of the client on site is important, and their regular site visits and has direct communication with the operators will have great impact on their safety behaviours.
Rating:
1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure

10. It is still difficult to ensure every worker on site follow all the safety regulations especially regarding the wearing of safety hat and boots all the time despite their knowledge about the regulations.
Rating:
1. Disagree 2. Agree a little 3. Agree **4. Strongly agree** 5. Unsure

11. During the production process for this project, give your rating for the following activities that help in the successful implementation of health and safety for the project.
Rating: 1-10

Activity	Rating
Client' brief or client's specification	4
Selection of main contractor	4
Type of procurement strategy	4
Preparation of Pre-tender health and safety plan	-
Method statement by main contractor-health and safety plan	-
Selection of consultants by contractor	5
Selection of sub-contractors and suppliers	6
Input by client during construction	6
Daily and weekly health and safety report by site supervisor	6
Inspection by HSE	7